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Rev. 07/10/02

176470 0.3
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Second Five-Year Review Report

for
Waste Disposal Engineering
City of Andover
Anoka County, Minnesota

April, 2003

PREPARED BY:

U. S. EPA - REGION 5

Approved by:

William E. Muno
Director, Superfund Division

4/30/03
Date

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Attachments

List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
EPA	United States Environmental Protection Agency
FSR	Final Site Remedy
HRL	Health Risk Limit
GCL	Geosynthetic Clay Liner
GWOU	Groundwater Operable Unit
MCL	Maximum Contaminate Limit
MHD	Minnesota Health Department
MPCA	Minnesota Pollution Control Agency
NPDES	National Pollutant Discharge Elimination
NPL	National Priority List
NOC	Notice of Compliance
O & M	Operation and Maintenance
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCOR	Preliminary Close Out Report
PRP	Potentiall Responsible Party
PSFD	Pilot Scale Field Demonstration
RA	Remedial Action

RCRA	Resource Conservation and Recovery Acg
RD	Remedial Design
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SCOU	Source Control Operable Unite
WDE	Waste Disposal Engineering
VOC	Volatile Organic Compounds

Executive Summary

The selected remedial alternative for the Waste Disposal Engineering Site was to cover the landfill with a vented cap, to contain contaminated groundwater discharges from the landfill through downgradient groundwater extraction wells, to contain an area within the landfill which received hazardous waste with a slurry wall and extraction well system, to avoid usage of contaminated groundwater and reversal of the upward gradient between the lower and uppers sand aquifers through institutional controls to limit wells on and near the site, to fill in and replace a wetland area affected by the site, to treat and dispose of extracted groundwater, which is expected to be accomplished by carbon adsorption and discharge to Coon Creek, and to monitor the site. The selected alternative includes the following major components.

- Lime sludge cap meeting Resource Conservation and Recovery Act (RCRA) technical performance standards.
- Groundwater extraction wells in the upper sand aquifer between Coon Creek and the landfill.
- Clay slurry wall around the Pit with pumping inside the wall.
- Institutional controls to prohibit uppers sand aquifer wells at the site and just north of Coon Creek and to prohibit lower sand aquifer wells near the landfill.
- Carbon adsorption treatment of extracted groundwater (air stripping or a combination) is possible based on design.
- Discharge of treated extracted groundwater to Coon Creek.
- Monitoring, including geophysical work around the site to locate heavier-than-water non-aqueous phase liquid monitoring, to assure the effectiveness of the remedy.

The Site achieved construction completion with the signing of the Preliminary Close Out Report on September 27, 1995. The trigger for this five-year review was the actual completion of the first five-year review on March 25, 1999.

The assessment of this five-year review found that the remedy was constructed in accordance with the requirements of the Record of Decision (ROD), the remedy is functioning as designed, source control measures (a vented cap cover over the landfill) has achieved its design criteria by significantly reducing both the production of leachate and toxicity of the compounds released from the landfill, and since the cover was constructed, there has been a reduction in the contaminant concentrations in the groundwater.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name ***(from WasteLAN)***: Waste Disposal Engineering		
EPA ID ***(from WasteLAN)***: MND980609119		
Region: 5	**State:** MN	**City/County:** Anoka County

SITE STATUS	
NPL status: Final x Deleted Other (specify) ______	
Remediation status (choose all that apply): ☐ Under Construction ☐ Operating x Complete	
Multiple OUs?* x YES ☐ NO	**Construction completion date:** 09 / 27/1995
Has site been put into reuse? ☐ YES x NO	

REVIEW STATUS	
Lead agency: EPA x State Tribe Other Federal Agency ______	
Author name: Gladys Beard	
Author title: NPL State Deletion Process Manager	**Author affiliation:** U. S. EPA, Region 5
Review period:** 01 /01 /2001 to 12 /31 / 2002	
Date(s) of site inspection: 10 /25 /2002	
Type of review: X Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion	
Review number: ☐ 1 (first) x (second) ☐ 3 (third) ☐ Other (specify) ______	
Triggering action: ☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____ ☐ Construction Completion x Previous Five-Year Review Report ☐ Other (specify) ______	
Triggering action date ***(from WasteLAN)***: 03 /25 /1999	
Due date ***(five years after triggering action date)***: 03 /25 /2004	

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

FIVE-YEAR REVIEW SUMMARY FORM, cont'd

Issues:

Continue with routine site maintenance including annual mowing of the vegetative cover, site inspections of cover and integrity cover. Continue with groundwater and surface water sampling program.

Recommendation and Follow-up Actions:

The active gas flare is ready to accommodate a stack test; this should be accomplished in 2003. In order to address detections in Coon Creek and in well nests 12 and 21; an additional extraction well should be installed between EW-3 and EW-4 and near Coon Creek.

Groundwater monitoring will continue quarterly for VOCs and annually for metals and general parameters. Monitoring wells completed into and through the waste should be monitored annually. Monitoring wells that are dry and completed through the waste in the upper sand should be abandoned (W-27A for example).

Condensate foams in the air stripper thus requiring frequent cleaning. Bypassing the condensate to tanks that are then trucked to MCES may reduce the amount of cleaning and provide a better means of dealing with that waste stream. The new MCES permit requires the use of the air stripper so it cannot be discontinued during this permitting period. Figure 32 indicates that influent concentrations met effluent standards during seven sampling events over the past 2 years. Continued tracking may result in discontinuing the air stripper if condensate is segregated out and data supports this action.

Protectiveness Statement(s):

All immediate threats at the site have been addressed, and the remedy is protective in the short-term of human health and the environment.

Long-Term Protectiveness:

Long-term protectiveness at the Waste Disposal Engineering Sanitary Landfill Superfund site (the Site) will be achieved by continuing the long-term monitoring of the ground water system. Long-term groundwater monitoring has demonstrated that the concentrations of the chemicals of concern have declined close to or below cleanup goals. Long-term trends show significant and adequate improvements in ground water quality.

Other Comments:

None.

Waste Disposal Engineering Inc. Superfund Site
Andover, Minnesota
Second Five-Year Review Report

I. Introduction

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The Agency is preparing this Five-Year Review report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The Minnesota Pollution Control Agency (MPCA) and the United States Environmental Protection Agency (EPA), Region 5, conducted the five-year review of the remedy implemented at the Site. This review was conducted by the Project Managers for the entire site from January 2001 through December 2002. This report documents the results of the review.

This is the second five-year review for the Site. The triggering action for this five-year review is the completion of the first Five Year Review in March 25, 1999. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1: Chronology of Site Events

Event	Date
Removal Assessment	6/19/92
Proposal to the NPL	12/30/82
NPL listing	9/08/83
NPL Search	9/30/84
RI/FS complete	12/31/87
ROD signature	12/31/87
Consent Decree	11/26/91
Consent Decree	10/26/93
Remedial design start	8/31/91
Remedial design complete	12/07/92
Actual remedial action start	10/08/92
Unilateral Admin Order	8/30/91
Preliminary Close Out Report	9/27/95
Deletion from NPL	6/05/96
Previous five-year reviews	3/25/99

III. Background

Physical Characteristics

Prior to development of the WDE Site in the early 1960's, land use consisted of cropland and pastureland, and open deciduous woodland with scattered wetland pockets. The area consisted of a glacial outwash plain characterized by low relief, poor external drainage, and fine, sandy soil. Also, located at the Site were two related drainage channels. One of these channels was eventually buried by the landfill while the other was abandoned when Coon Creek was straightened. In addition, by 1964, three fields ditches had been constructed on the northeast portion of the present landfill. These ditches, which are partially buried, drain to the north and empty into Coon Creek.

The landfill (dump) was established in the early 1960's by Leonard E. Johnson. By 1964, the dump covered only three acres. In 1970, the landfill had expanded to cover 41 acres, and by 1983 to its present day size of 114 acres. The dump was purchased by WDE in 1968. In 1971, construction of the WDE pit began. The Pit was completed in 1972 and was operated until January, 1974. The landfill operated until 1984.

The site operated as an open dump from 1963 to 1971, and as a landfill from 1971 until 1983. Approximately 2.5 million cubic yards of solid municipal and industrial wastes and 3 million gallons of liquid industrial wastes were deposited at the site during this time. The site was proposed for the NPL July 16, 1982. The listing was finalized on September 8, 1983, Federal Register number 175, volume number 48 and Page number 40658-40682.

Land and Resource Use

The WDE Site is located within the City of Andover (formerly Grow Township), Anoka County, Minnesota, approximately 15 miles north of the City of Minneapolis. It is situated on the south side of Coon Creek, which discharges into the Mississippi River 11 river miles downstream from the Site. The discharge into the Mississippi River is approximately 3 miles upstream of the intake for the St. Paul water supply and 7 miles upstream of the intake for the Minneapolis water supply.

The WDE Site is situated within the Anoka Sand Plain. The topography is gently rolling to flat, with shallow water tables (less than 20 feet) and numerous wetlands. The area surrounding the WDE Landfill historically was comprised of small farms and small residential developments. Immediately south of the Site is a series of scrapyards. The Site is bounded on the north by Coon Creek, with flows in a west-northwesterly direction at this location. To the west, the Site is bounded by Anoka County Road 16 (Bunker Lake Boulevard). Hanson Boulevard borders the eastern edge of the WDE Site. Along the eastern edge of the Site are two overlapping easements, United Power Association (45 feet wide) and Northern States Power Company (150 feet wide).

The original dump was established in 1963 by a Mr. Leonard Johnson. Disposal of wastes took place by burial or burning in pits or trenches. WDE purchased the facility in 1968 and was licensed by Grow township to operate as a sanitary landfill. In 1970, WDE submitted a solid waste permit application to the MPCA, including a proposal to build a specially constructed pit for disposal of hazardous waste. The permit (SW-28) was issued on March 30, 1971 to operate the WDE Site as a sanitary landfill. The Site operating permit was revoked by the MPCA in February 1984.

The WDE facility ceased operations in February 1984 and has remained abandoned and inactive. The property of the Site has gone through tax forfeiture so that it is currently property of the State of Minnesota with administration by Anoka County.

History of Contamination

The WDE hazardous waste pit received hazardous wastes from November 1972 to January, 1974. The base of the pit was specified to be a 18-inch layer of clay overlain by a six-inch bituminous layer and six inches of crushed limestone. Approximately 6,600 containers (ranging from 1 gallon pail to 55 gallon drums) holding a wide variety of wastes (acids, caustics, waste paints, spent solvents, plating sludges, cyanides) are thought to have been disposed in the pit. An undetermined quantity of hazardous waste, much of it as bulk loads, was disposed throughout the landfill. Based on interviews and government files, approximately 3.2 million gallons of hazardous waste are thought to have been disposed at the WDE Site. Using these estimates, only 10 percent of the waste expected to be at the Site would have been disposed in the pit.

The area of actual refuse disposal in the landfill covers an area of 73 acres. The maximum thickness of waste is 40 feet. The landfill contains nearly 2.5 million cubic yards of waste. Much of the landfill is covered by lime sludge obtained from the Minneapolis Drinking Water Treatment Plant. The lime sludge consists of very fine particles of lime that yields a clay-like substance. The sludge thickness ranges from three to six feet (average of four feet). Additional lime sludge was stockpiled on ten acres immediately southeast of the area of refuse disposal.

Initial Response

A Remedial Investigation/Feasibility Study was conducted at the site from 1984 through 1987. Contaminants of concern identified at the site include a number of volatile organic compounds in ground water, including 1,1,1-trichloroethane, trichloroethene, and vinyl chloride, at concentrations well above Maximum Contaminant Levels. The site posed potential threats to human health and the environment through direct contact with wastes, soils, and leachate seeps; ingestion of ground or surface water impacted by the site; and possible off-site migration of landfill gas containing hazardous constituents.

Basis for Taking Action

Contaminants

Hazardous substances that have been released at the Site in each media included:

Soil and Groundwater

1,1 Dichloroethane
1,2 Dichloroethene
1,1,2-Trichlorotrifluoroethane
1,1,1-trichloroethane
Methyl ethyl ketone
Methyl Isobutylketone
Dichloroethane
Toluene
Xylene
Methylene chloride
Acetone
Tetrahydrofuran
1,1 Dichloropropene
Benzene
Dibromochloromethane
1,1,2 trichloroethane
1,1,2,2-Tetrachloroethane
Trichloroethene
1,3 Dichloropropene
Ethylbenzene
Cumene
Ethyl ether

For all other chemicals reference the WDE Sanitary Landfill 1997 Annual Report completed January 5, 1998.

IV. Remedial Actions

Remedy Selection

The ROD for the WDE Sanitary Landfill Site was signed on December 31, 1987. Remedial Action Objectives (RAOs) were developed as a result of data collected during the Remedial Investigation to aid in the development and screening of remedial alternative to be considered for the ROD. The RAOs for WDE are listed below:

- Lime sludge cap meeting Resource Conservation and Recovery Act (RCRA) technical performance standards.

- Groundwater extraction wells in the upper sand aquifer between Coon Creek and the landfill.

- Clay slurry wall around the Pit with pumping inside the wall.

- Institutional controls to prohibit uppers sand aquifer wells at the site and just north of Coon Creek and to prohibits lower sand aquifer wells near the landfill.

- Carbon adsorption treatment of extracted groundwater (air stripping) or a combination is possible based on design.

- Discharge of treated extracted groundwater to Coon Creek.

- Monitoring, including geophysical work around the site to locate heavier-than-water non-aqueous phase liquid monitoring, to assure the effectiveness of the remedy.

The major components of the remedy selected in the ROD include the following:

1. A multilayer soil cap;
2. A groundwater containment (extraction and treatment) system;
3. A slurry wall/non-aqueous phase layer control system for a portion of the site;
4. Wetlands replacement;
5. A monitoring program for groundwater, surface water, and landfill gas;
6. An operation and maintenance program; and
7. Institutional controls.

Remedy Implementation

After attempts at negotiating a consent decree with the PRPs failed, U.S. EPA issued a CERCLA Section 106 Unilateral Administrative Order for Remedial Design/Remedial Action (RD/RA) to 28 PRPs on August 23, 1991. The PRPs agreed to implement the Order and completed RD for OU 1, the groundwater containment system, in October 1992. OU1 construction was initiated in October 1992 and completed in September 1993. RD for OU 2, the multilayer cap, was completed in December 1992, with construction completed in August 1994. The State provided oversight of all RD/RA activities under a cooperative agreement with U.S. EPA. U. S. EPA and the State conducted a final inspection of the site on August 9, 1994.

After the final inspection was completed, the PRPs were required to discontinue operation of the groundwater containment system for several months due to difficulties in meeting permit requirements for the groundwater (which discharged to a sanitary sewer). The groundwater exhibited a low flash point, creating the hazard of fire or explosion in the sewer, and the PRPs concluded that the presence of landfill gas in the groundwater was responsible. U. S. EPA approved the PRP's proposal to construct an air stripping system for the extraction of groundwater in March 1995 and the system was completed in June 1995.

System Operation/Operation and Maintenance

A six-foot thick final cover system was constructed over the entire landfill in 1993, including a two-foot thick compacted clay barrier layer. Severe erosion was repaired during the summer of 1994. Since 1994, minor erosion has been repaired on an as-needed basis. The landfill cover is mowed each summer in August to allow for ground nesting birds to mature enough to fly away when the mowing equipment comes near.

During construction of the active gas extraction system in the summer of 1998, it was found that the cover soils did not consistently meet 1993 design specifications and was not of a uniform 6 foot thickness. Those areas disturbed by construction of the active gas extraction system were reconstructed using the existing clay soil overlain by a geosynthetic clay liner (GCL). A GCL is a quarter-inch thick layer of bentonite clay sandwiched between filter fabric. In addition, the waste extended beyond the limits of the cover in the area where the flare was being built. This waste was removed and placed back in the landfill. The existing passive gas vents were also sealed as part of this construction project.

The design and preliminary work to install an active gas extraction system was completed in 1997. An active gas extraction system was installed and began start-up on August 27, 1998. This system is designed to remove landfill gas including methane and volatile compounds from the waste and combust them in an enclosed flare. There are 54 gas extraction wells placed in the landfill. One of the gas extraction wells is installed in the hazardous waste pit to further reduce ground water contamination (Figure 1).

The active gas extraction system shut down five times in 2001 and twice in 2002. All shut downs were short in duration, caused by various equipment malfunctions such as a blocked flame arrestor, failed oxygen sensor, high condensate sump level, or freeze up of the gas flow sensor. The flare operated between 98 to 100 percent of the time from January 2001through July 2002.

Nineteen (19) landfill gas-monitoring probes are found at 17 locations at the WDE Sanitary Landfill. Results of the monthly to quarterly gas monitoring are shown in Table 1. Migration off-site of landfill gas above Minnesota Rule criteria of 100 percent lower explosive limit does not appear to be occurring.

Gas probes GP4, GP6A, and GP6B are located adjacent to waste, so positive explosive gas readings are not unexpected, even when the gas extraction system is operating. Figures 2 and 3 show the detections measured at these three gas probes for 2001 and 2002, respectively. Gas migration is controlled effectively at all the other gas probes. No significant detections of explosive gas were found beyond the site property lines in 2001 through 2002.

Well W-27A has been dry for the past 3 years despite a wetter than usual year in 2002. This suggests that well construction or some obstruction may be responsible for the lack of water in the well. W-27A is finished in the fill area and should be abandoned. The bladder in W-12C appears to fail at a frequent rate. A new design of bladder bag replacement kit was purchased in June 2002 and should be more durable for these wells. Wells W-17, W-6, W-12A, and W-2A may need development in 2003 based on comments received.

Table 2 - Annual System Operations/O&M Costs

Dates		Total Cost
From	**To**	
7/2000	6/2001	$140,838
7/2001	6/2002	$123,257

V. Progress Since the Last Five-Year Review

During the last Five-Year Review the MPCA determined that additional corrective action was necessary to accelerate groundwater remediation. An active gas extraction system and enclosed flare to better control methane migration and remove volatile compounds prior to leaching into groundwater was chosen. The active gas extraction system operated at 99 percent of the time during the past 2 years. The influent and effluent data showed a marked increase in contaminants removed seasonally from the groundwater and the landfill gas.

VI. Five-year Review Process

Administrative Components

This Five-Year Review Report was written and completed by EPA, based on the technical review of the Site by members of the MPCA staff. This Five-Year Review Report was written by Gladys Beard of EPA.

From January 1, 2001 to December 31, 2002 the review team established the review schedule whose components included:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection;
- Local Interviews; and
- Fiev-Year Review Report Development and Review.

Community Involvement

Notice will be made to the public announcing the Five-Year Review Report and providing a summary of Five-Year Review findings, protectiveness of the remedy, and advising the community where a copy of the review report can be found. This Five-Year Review Report can be found in the Site's Information Repository.

Document Review

This Five-Year Review consisted of a review of relevant documents including O&M records, monitoring data, and the MPCA's Annual Report form the last pasted five years and the last Five-Year Review Report. All cleanup standards in the ROD were reviewed.

Data Review

Groundwater Monitoring

The groundwater containment system has operated without interruption since June 1995, and no further construction is anticipated on the system. Well W-27A has been dry for the past 3 years despite a wetter than usual year in 2002. This suggests that well construction or some obstruction may be responsible for the lack of water in the well. W-27A is finished in the fill area and should be abandoned. The bladder in W-12C appears to fail at a frequent rate. A new design of bladder bag replacement kit was purchased in June 2002 and should be more durable for these wells. Wells W-17, W-6, W-12A, and W-2A may need development in 2003 based on comments received.

Interpoll Laboratories, Inc. collected 6 rounds of water quality samples between 2001 and 2002 at the WDE Landfill. The sampling start dates for these events occurred on April 6, 2001; June 20, 2001; November 12, 2001; March 25, 2002; June 25, 2002; and September 23, 2002. The landfill monitoring system consists of 57 wells and 4 surface water sampling points. Twenty-one additional piezometers are used to determine ground water elevations. A cross-section showing the general geology of the landfill area is presented on Figure 4. Monitoring wells have been completed in both the Upper and Lower Sand horizons.

Daily, monthly, and annual precipitation graphs are included as Figures 5 through 7. The trend of monthly precipitation in 1998 when compared to the 1997 trend indicates that there was more accumulation in 1998 despite the maximum monthly precipitation occurring in 1997. The trend of monthly precipitation in 1999 follows a bell shaped curve with the maximum obtained in May 1999 whereas the maximum in 1998 was in August. In addition, the last three months of 1999 exhibit very low rainfalls. The monthly precipitation in 2000 exhibits two peaks; one in May and the other in October. The October peak was the largest of the year with 1.5 inches of rainfall. This trend is validated by annual precipitation; in 1998 the site annual precipitation exceeded the average while in 1997 the site annual precipitation was less than the average. In 1999, the annual rainfall was slightly less than the previous year. Annual rainfall measured for 2000 indicates a drop in precipitation to 1997 levels with approximately 25 inches measured. Precipitation in 2001 and 2002 started a trend of wet years with monthly precipitation peaking at 9 inches in March 2001 and 6 inches in July 2002. Annual precipitation also far exceeds precipitation in 2000 with the annual amount in 2001 reaching 36 inches and the amount for 2002 represented by 10 months worth of data already has exceeded the 2001 total.

Graphs showing trends in ground water elevations and total VOC concentrations are also included on Figures 8 through 34. The ground water gradient in the shallow aquifer could not be determined with the available data. Review of ground water data indicates that the ground water flow direction in the surficial aquifer was to the north.

Review of ground water elevation data indicates that the groundwater flow direction in the surficial aquifer was generally to the north (Figure 8 and 33). The flow has been consistent in the 3 units because of the ground water extraction system (Figure 11). The water levels were consistent among each other in 2001 and 2002 and indicate an increasing trend consistent with the increased precipitation seen in 2001 and 2002. A sharp rise is seen in the hydrographs in April 2001 that is attributed to the wettest month in the 2 year period (Figures 15, 19, 21). Wells in the Upper Sand that are screened below the fill (both at the water table and at the base of the Upper Sand) indicate that there is a slightly decreasing trend (Figures 12, 13). This suggests that both ground water extraction and methane gas extraction at EW-9 (the hazardous waste pit) remove water from the system.

The horizontal hydraulic gradient was consistently flat beneath the fill area. Gradients were only calculated for specific events representative of the past 2 years. In the Lower Sand, the horizontal hydraulic gradient was 0.002 feet/foot (calculated using September 2002 data). In the Upper Sand at the water table, the horizontal hydraulic gradient was 0.0075 (calculated using June 2002 data) and is similar to those measured in 1999-2000. At the base of the Upper Sand, the horizontal hydraulic gradients are steeper reflecting impacts due to the extraction wells. The horizontal hydraulic gradient near the extraction wells was steeper by a factor. The horizontal gradient measured far from the extraction wells was 0.005 feet per foot (March 2002). Near the hazardous waste pit, the gradient was 0.0125 (March 2002).

The relative direction of the vertical hydraulic gradients had remained consistent from 1992 until 1999. However, in 2000 gradient directions or magnitudes changed at a majority of well nests and the trends have continued to the present. Upgradient monitoring well nests in the Upper Sand show flatter downward gradients. (The exception is one reading at W-15A and W-15B). Upgradient monitoring well nests in the Lower Sand show flat downward to no gradients (well nest 1 being the exception with one reading). Gradients measured at W-1 nest may be impacted by the sledding hill. Upper Sand monitoring well nests in the fill area show very erratic data that may be in response to pumping of EW-9. The vertical gradients in the Lower Sand wells that are cross gradient to flow are steep and downward. Downgradient Lower Sand monitoring wells show vertical gradients that are moderate to steep and are upward. Downgradient Upper Sand well nests on the south side of Coon Creek show a flat to steep upward gradient at the top of the aquifer and a moderate downward gradient at the base of the aquifer. These gradients are strong near the pumpout wells and moderate near the creek. North of Coon Creek the vertical gradients are moderately upward. The vertical gradients indicate that the extraction wells are capturing flow since the upward gradients are predominant in the Upper Sand.

The Minnesota Department of Health Chemical Laboratory analyzes the ground water samples for inorganic and organic parameters. Ground water samples collected from monitoring wells and groundwater extraction wells have shown no impacts to water quality due to the landfill. Ground water quality data collected near the hazardous waste pit (Figure 14) shows a complex relationship between groundwater extraction and precipitation. There appears to be a correlation between precipitation and contamination detected although there is a time lag between the two. Since EW-9 does not have high yield its possible that it becomes overwhelmed in high flow periods and cannot capture all the contamination or peaks in contamination may be due to extraction wells being off-line because of maintenance issues. Figures 25 through 27 shows the concentrations of total VOCs across the site in the surficial aquifer. The highest concentrations are in monitoring wells W-11A, W-32A, W-33A, and pumpout well EW-9. W-32A and W-33A are impacted by flow from the hazardous waste pit and EW-9 is located inside of it. The high concentrations detected at W-11A may be due to downtime of the extraction wells. However, the high concentration does not extend to Coon Creek. The highest concentration detected over the two-year period at the water table was in June 2001 with a concentration of 7,000 microgram per liter total VOCs. Concentrations detected at the base of the Upper Sand are contoured in Figures 26 and 27. Concentrations exceed 750,000 micrograms per liter total VOCs. Compounds detected at these wells include 1,1 dichloroethane, cis-1,2 dichloroethene, 1,1,2,2 tetrachloroethene, 1,2 dichloroethane, 2 methyl phenol, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, ethylbenzene, toluene, 1,1,2 trichloroethene, trans-1,2 dichloroethene, 1,1,1 trichloroethane, tetrahydrofuran, vinyl chloride, 1,1,2 trichloroethane, acetone, 1,1 dichloroethene, chlorobenzene and nickel. Levels of many VOCs detected in the monitoring wells on site exceed the Health Risk Limits (HRLs).

Those compounds that exceed standards at the compliance boundary are arsenic, benzene, manganese, nickel, tetrahydrofuran, vinyl chloride, and 1,1,2,2 tetrachloroethene. The monitoring wells completed in the lower sand aquifer have not shown VOC contamination from the landfill. The monitoring wells north of Coon Creek exceeded the HRLs for manganese and

1,1,2,2 tetrachloroethene.

Many of the monitoring wells outside of the fill area exceed the HRL for manganese. The amount found in the fill can vary from 1 to 7 mg/l so the ground water may be naturally high in manganese.

A ground water remediation system is in operation at the WDE Landfill. The ground water remediation system includes 8 pumpout wells. Maintenance on the system includes optimizing flow to the extraction wells; jetting wells, lines and forcemains; replacing pumps, pump motors and flow meters; and cleaning the low profile air stripper. The details of maintenance are found in weekly Facility Inspection Reports prepared by Willow Brook Engineering, the O & M contractor for the site. However, of note is that the low profile air stripper was cleaned 21 times from January 2001 through October 2002 and may necessitate the segregation of the condensate (compare Figure 30 and Figure 34) to reduce the amount of cleaning.

The ground water pumpout system captures contaminated groundwater moving north from the WDE Landfill towards Coon Creek and the adjacent residential wells. Although the pumpout system is operating as designed, substantial improvements in ground water quality have not been noted at the hazardous waste pit. The pumpout system removed approximately 840 pounds of VOCs in 1996, 401 pounds in 1997, 992 pounds in 1998, 706 pounds in 1999, 574 pounds in 2000, 944 pounds in 2001 and 513 pounds in 2002 (based on 10 months of data). Higher than normal precipitation over the past two years has overwhelmed the ground water extraction system so that not as much water was extracted in comparison to 2000 (and 2000 seemed like a lean year in comparison to the previous years). This has resulted in contamination continuing to impact wells north of Coon Creek. The contamination appears to find a path between EW-3 and EW-4 especially if EW-9 is down. This is verified by the presence of contamination at wells W-3, W-7, W-11A and W-11B.

Although EW-9 has one of the slowest pumping rates of the pumpout wells, its location in the hazardous waste pit enables it to extract the most contaminated ground water and remove the highest mass of VOCs. EW-9 removed approximately 94% of the total VOCs in 1997 and 98 % of the total VOCs in 1998, 1999 and 2000. The removal rate increased to 99 % in 2001 and 2002. Figure 28 shows the flow pattern for one sampling event around the hazardous waste pit. These measurements suggest a bathtub effect of flow around the pit with EW-9 as the drain. The installation of more piezometers around the pit may provide more detail to the puzzling data and indicate how flow is entering the pit.

The last time the flashpoint exceeded the standard was in November 1995. Since the installation of the air stripper, the flash point readings for the treated water have been acceptable for discharge into the sanitary sewer. Figure 29 shows the correlation of flash point values to total VOC concentrations in the influent and effluent water. The air stripper is doing a good job since the effluent concentrations are on a declining trend (Figure 29b). Figure 30 indicates how the concentration of the gas condensate varies exponentially and this overwhelms the air stripper at times so that the influent exceeds the MC standard (Figure 34). This figure also illustrates that there is a lag effect between precipitation and influent concentration.

Concentration contour maps have been included to illustrate the effectiveness of the pump system. Figures 26 and 27 show the concentration contours as plotted for representative events in 2001 and 2002. EW-6 and EW-7 pump the greatest amount of ground water. The system does appear to have been effective in containing the northward spread of the contamination because of pumping at EW-9. Monitoring wells located north of Coon Creek generally show a slight decrease in VOC levels, although W-21B continues to have VOC contamination. There is a steep concentration gradient observed between W-11 nest (south side of Coon Creek) and W-21 (north side of Coon Creek). This may be remedied by increasing the yield at EW-3 or installing a new extraction well between EW-3 and EW-4.

The volume of water extracted from EW-4, EW-6, and EW-7 has bypassed the air stripper and sanitary sewer and was diverted to an expanded on-site sedimentation basin since October 1998. The ground water diverted to the sedimentation basin is then allowed to infiltrate back into the aquifer. The concentration of contaminants in these wells does not exceed the Health Risk Limits but they are operated to provide gradient control of the plume. In 2001 to 2002, the volume of ground water diverted to the sedimentation basin was 16,234,424 gallons (excluding data from November and December 2002). The diversion of ground water has reduced the charge to sewer the treated ground water by more than half from $25,837 in 1998, $10,624 in 1999, $8,053 in 2000, $6523 in 2001 and $9800 in 2002. (A delay in invoicing may account for the higher number in 2002).

Monitoring wells and piezometers that have gone dry in the fill area, should be properly sealed if they cannot be redeveloped. Select monitoring wells should be redeveloped to reduce turbidity levels.

Surface Water and Sediment Monitoring

Surface water samples collected from Coon Creek have shown impacts from organic parameters and metals. VOCs detected included traces of xylene (different isomers). The Aquatic Life Standards for a Class 2B Water were not exceeded for any of the VOCs between 2001 and 2002. Four metals were detected above Aquatic Life Standards during 2001 to 2002 sampling events. However, mercury detected in June 2001 and June 2002 has not been verified as a landfill source since the background sample also contained mercury above standards. Cadmium and Chromium detected at CC6/SG1 in April 2001 exceeded the Aquatic Life Standards (see Table 9). This station is not the farthest downstream station but is near well nest 12 and 21. In both cases the other stations did not detect concentrations at this magnitude. April 2001 was the wettest month during 2001 and 2002 and so the flow of the creek may have been rapid with it being difficult to collect representative samples at all four stations. Copper exceeded the Aquatic Life standards in March 2002. This violation is verified by the other samples collected during that event. Mercury exceeded the standard in September 2002 but was detected at the detection limit at CC5 and CC7; this was another month of a lot of precipitation.

Site Inspection

A Site Inspection at the site was conducted on October 25, 2002, by MPCA. The purpose of the inspection was to assess the protectiveness of the remedy, including the common maintenance activities: annual mowing of landfill cover, grass and brush trimming around wells, fence repair/maintenance, access road maintenance, snow plowing, and litter control. In addition, MPCA staff are at the site several times each month to check on site conditions, equipment performance and site security. Weekly inspections in 2001 and 2002 were conducted by the O & M contractor, Willow Brook Engineering.

Interviews

In processing this report U. S. EPA interviewed the MPCA to obtain information. None of MPCA staff was able to identify any concerns regarding the Site and there had not been any emergency responses at the Site.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, ARARS, risk assumptions, and the results of the site inspection indicates that the remedy is functioning as intended by the ROD. The stabilization and capping of the contaminated landfill have achieved the remedial objectives to minimize contaminants to groundwater and surface water and prevent direct contact with, or ingestion of, contaminants in soil and groundwater. The effective implementation of institutional controls has prevented exposure to, or ingestion of, contaminated groundwater.

Operation and maintenance (O.M.) of the cap and groundwater have been effective. O.M. annual costs are consistent with original estimates and there are no indications of any difficulties with the remedy.

No activities were observed that would have violated the institutional controls. The cap and the surrounding area were undisturbed, and no new uses of groundwater were observed. The fence around the Site is intact and in good repair.

Question B: Are the exposure assumptions, toxicity data cleanup levels and remedial action objectives (rads) used at the time of the remedy selection still valid?

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

The exposure assumptions used to develop the Human Health Risk Assessment included both current exposures (older child trespasser, adult trespasser) and potential future exposures (young and older future child resident, future adult resident and future adult worker). There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment. These assumptions are considered to be conservative and reasonable in evaluating risk and developing risk-based cleanup levels. No change to these assumptions, or the cleanup levels developed from them is warranted. There has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. The remedy is progressing as expected and it is expected that all groundwater cleanup levels will be met within approximately the time frame stated in the ROD.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No ecological targets were identified during the baseline risk assessment and none were identified during the five-year review, and therefore monitoring of ecological targets is not necessary. All groundwater and surface water samples analyzed found no contamination of wetlands or surface water. No weather-related events have affected the protectiveness of the remedies. There is no other information that calls into question the protectiveness of the remedies. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedies are functioning as intended by the ROD. There are no changes in the physical conditions of the site that would affect the protectiveness of the remedy. There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedies. There is no other information that calls into question the protectiveness of the remedies.

VIII. Issues

Table 3: Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
The gas system will have a stack test in 2003	N	Y
An additional well will be added and monitoring continue	N	Y

IX. Recommendations and Follow-up Actions

Table 4: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Continue to remove contaminant through the gas sytem	The active gas system will continue to operate 99 percent of time	MPCA	MPCA	Continuous	N	Y
Continue with routine site maintenance	Ground water and methane monitoring, inspections, erosion repair and mowing will be continue	MPCA	MPCA	Weekly	N	Y
Reduce the amount of cleaning needed for the air stripper	Evaluate the benefits of collecting condensate in a separate tank and disposal at a plant	MPCA	MPCA	2003	N	Y

X. Protectiveness Statement(s)

The remedy is protective in the short-term of human health and the environment. All immediate threats at the site have been addressed. All threats at the Site have been addressed with a vented cap, to contain contaminated groundwater discharges from the landfill through downgradient groundwater extraction wells, to avoid usage of contaminated groundwater and reversal of the upward gradient between the lower and uppers sand aquifers through institutional controls to limit wells on and near the site.

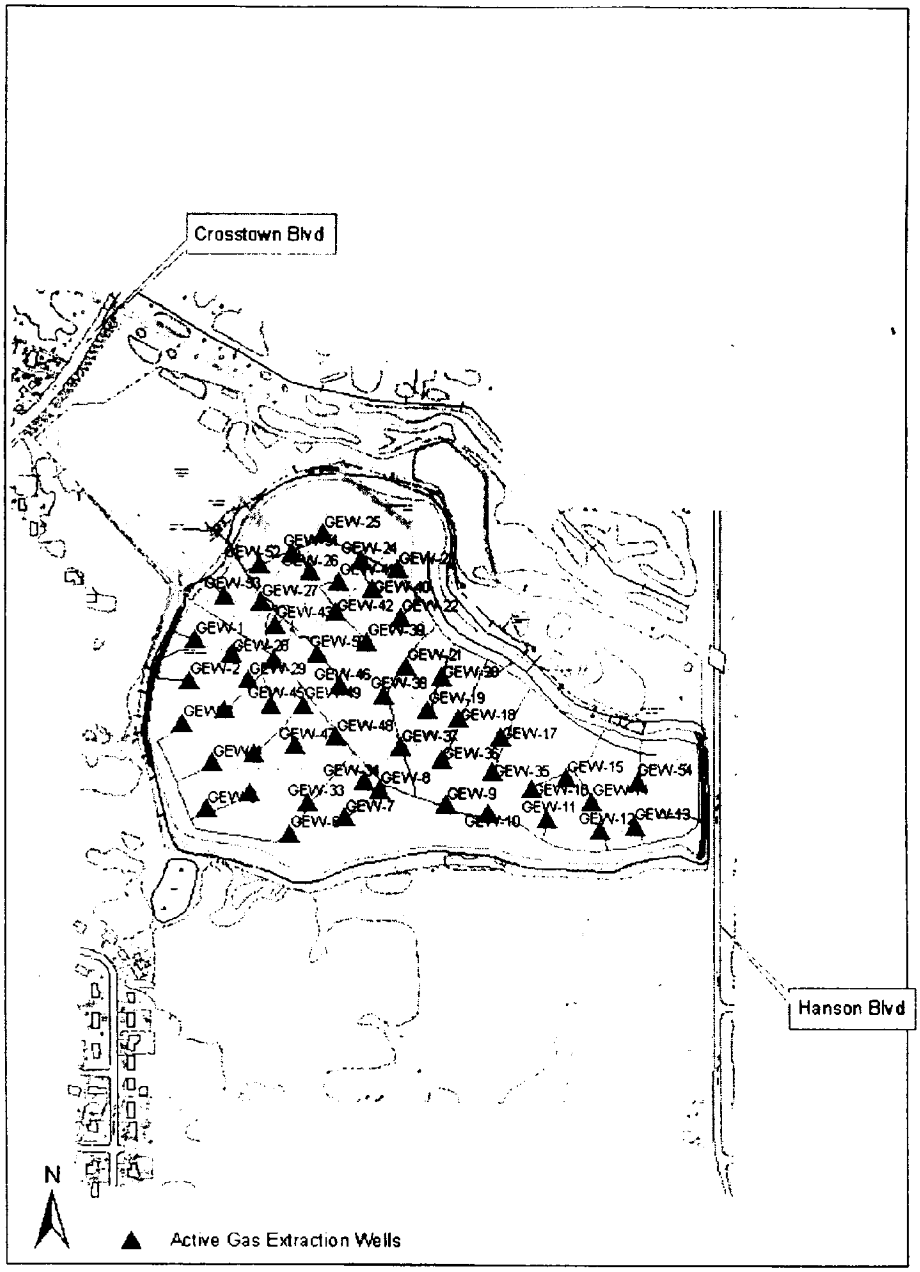
Long-term protectiveness of human health and environment will be achieved upon attainment of groundwater cleanup goals, through treatment and disposalof extracted groundwater, which is expected to be accomplished by carbon adsorption and discharge to Coon Creek, and to monitor the site.

Long-term protectiveness of the remedial action will be verified by conducting geophysical work around the site to locate heavier-than-water nonaqueous phase liquid, to assure the effectiveness of the remedy.

XI. Next Review

The next five-year review for the Site will be completed five years from this report in April 2008.

Site Map



2,400 Feet

Figure 1: Site Map showing Active Gas Extraction Wells

Figure 2. WDE Gas Probe Methane Reults - 2001

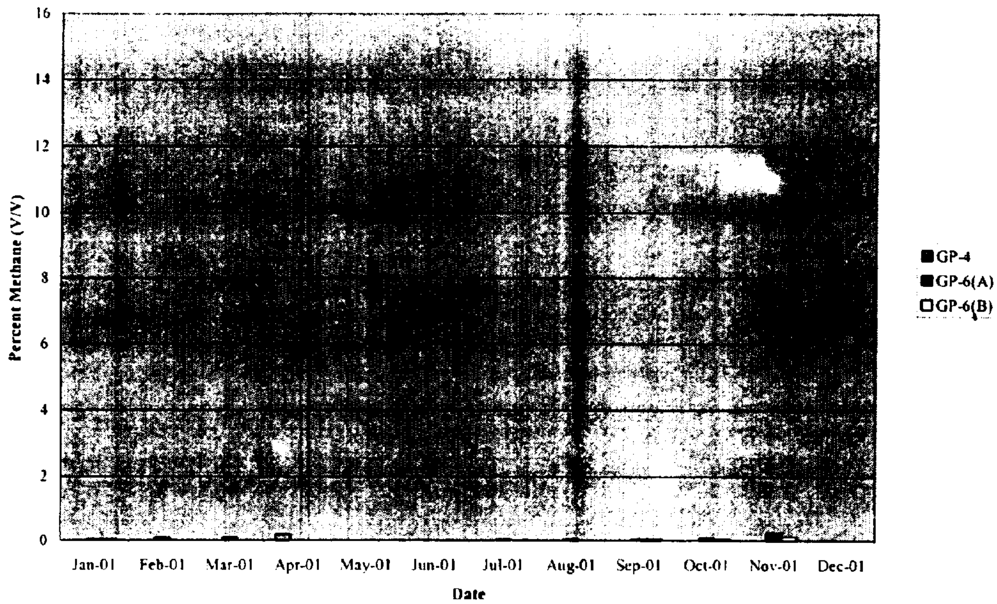
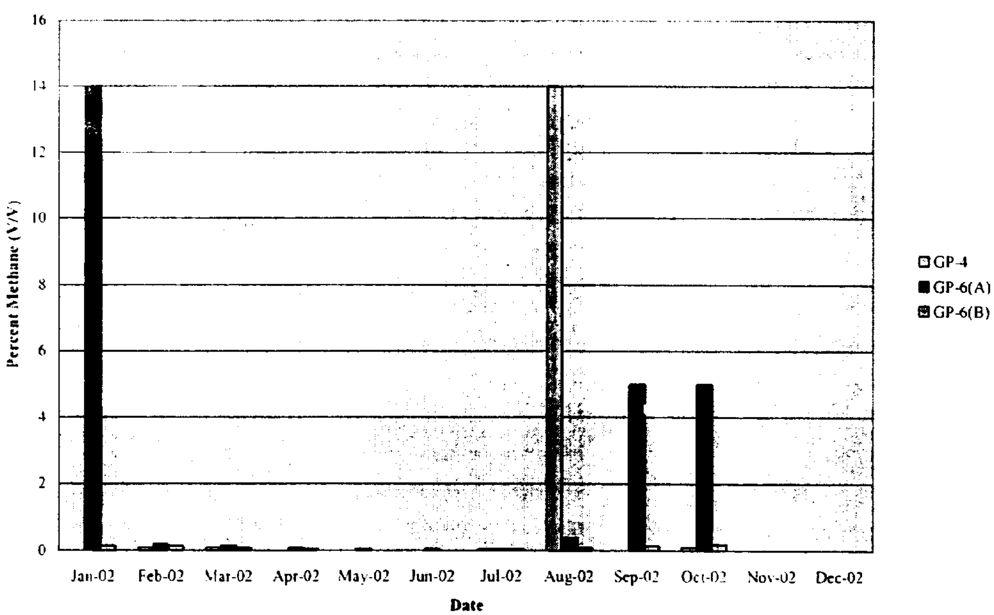


Figure 3. WDE Gas Probe Methane Results - 2002



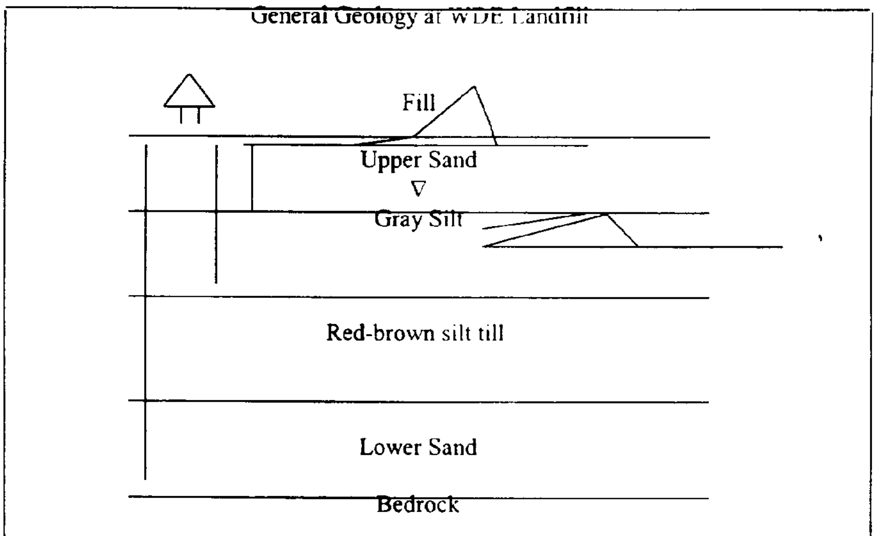


Figure 4: Geology at WDE Landfill, vertical lines represent wells in D, B, and A horizons, from left to right

Figure 5. Daily and Monthly Precipitation from January 1, 1999 through November 2, 2002

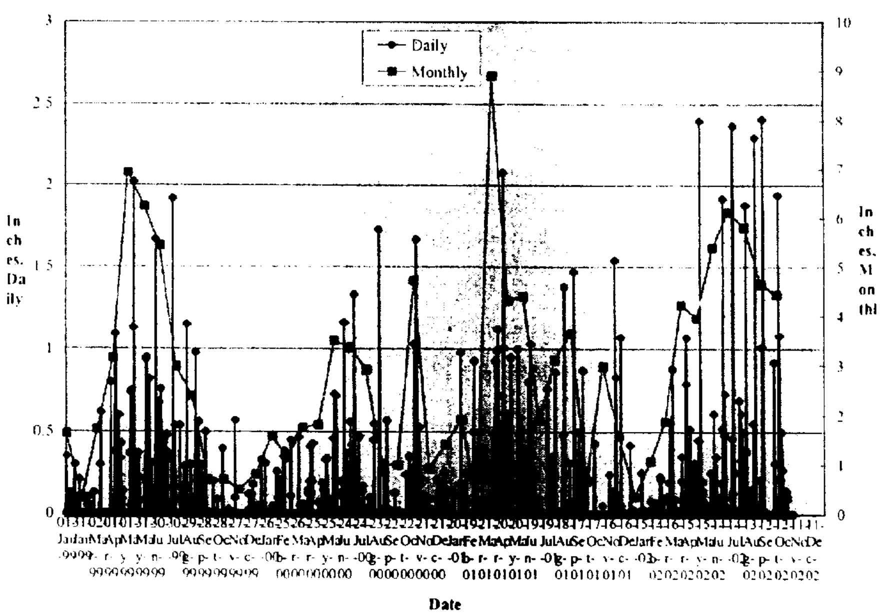


Figure 6. WDE Monthly Precipitation

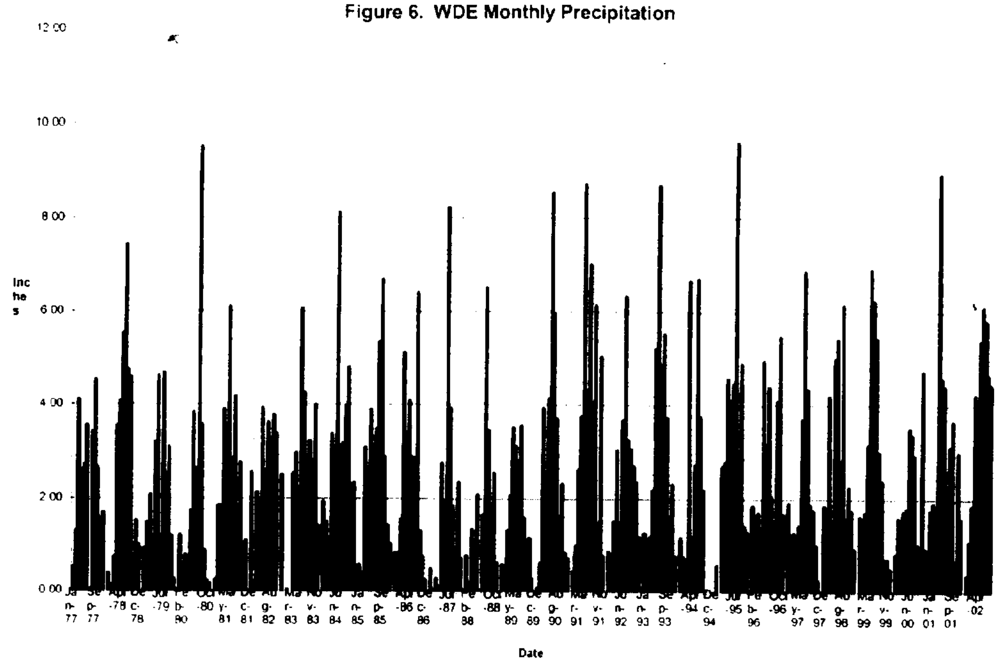


Figure 7. WDE Annual Precipitation

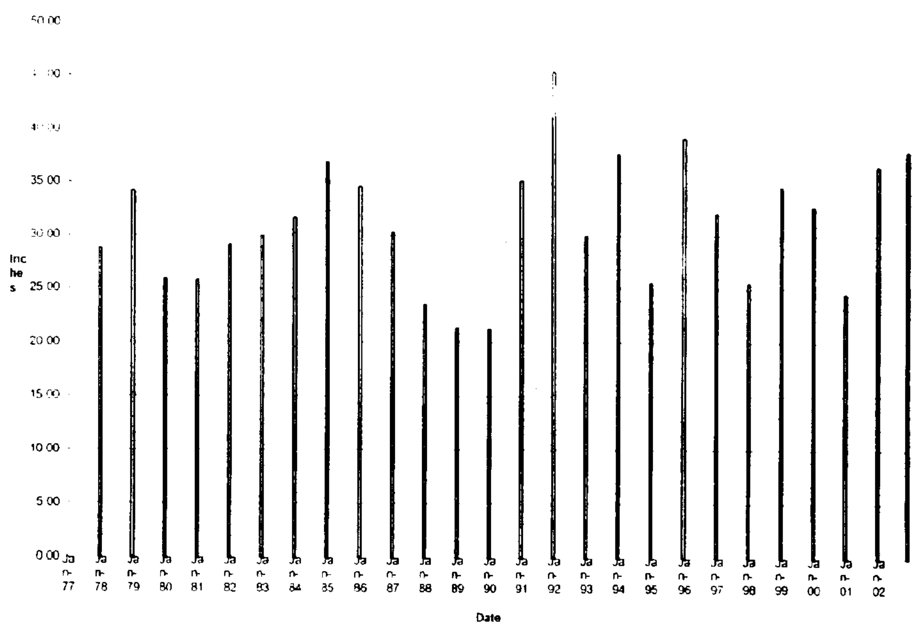


FIGURE 8. WDE Lower Sand Ground Water Elevations

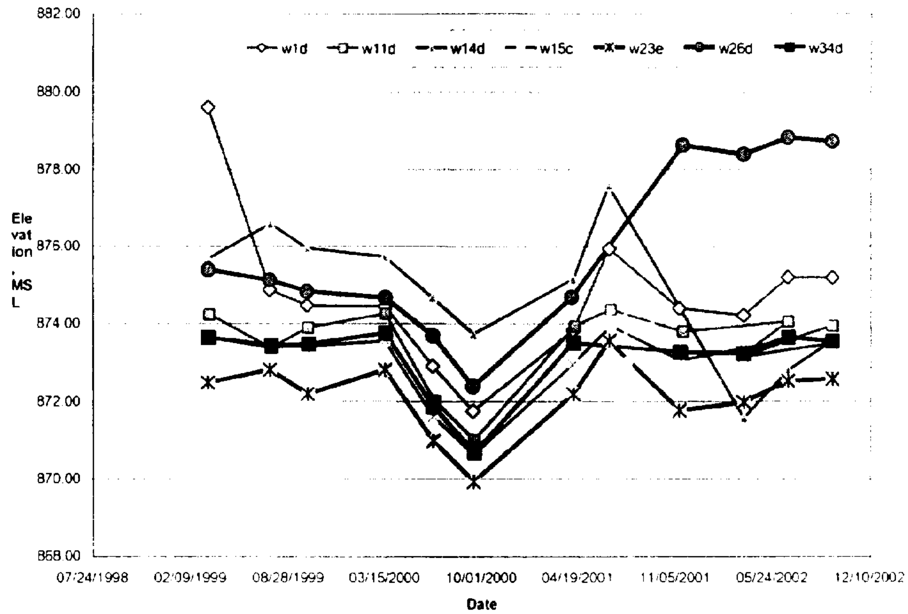


FIGURE 9. WDE Coon Creek Water Elevations

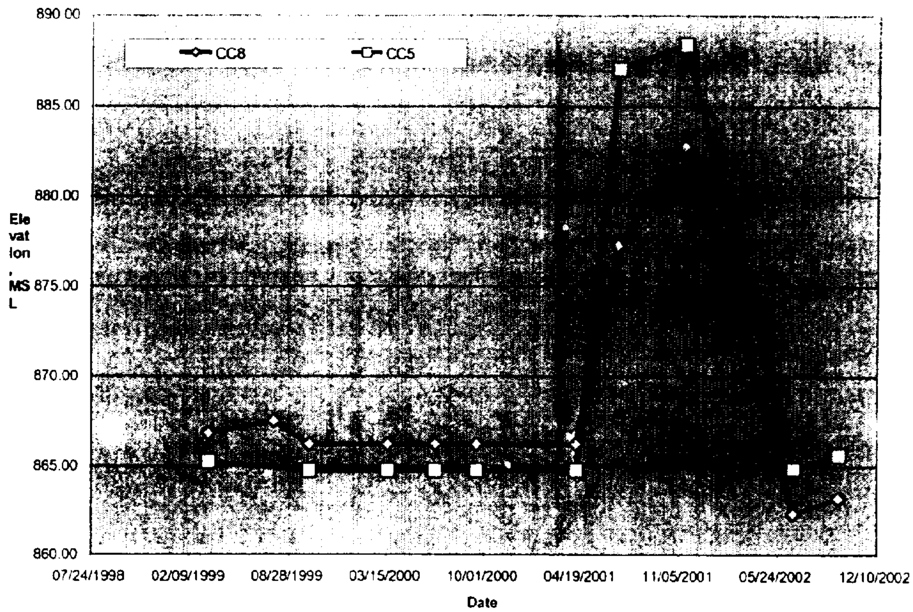


FIGURE 10. WDE Coon Creek

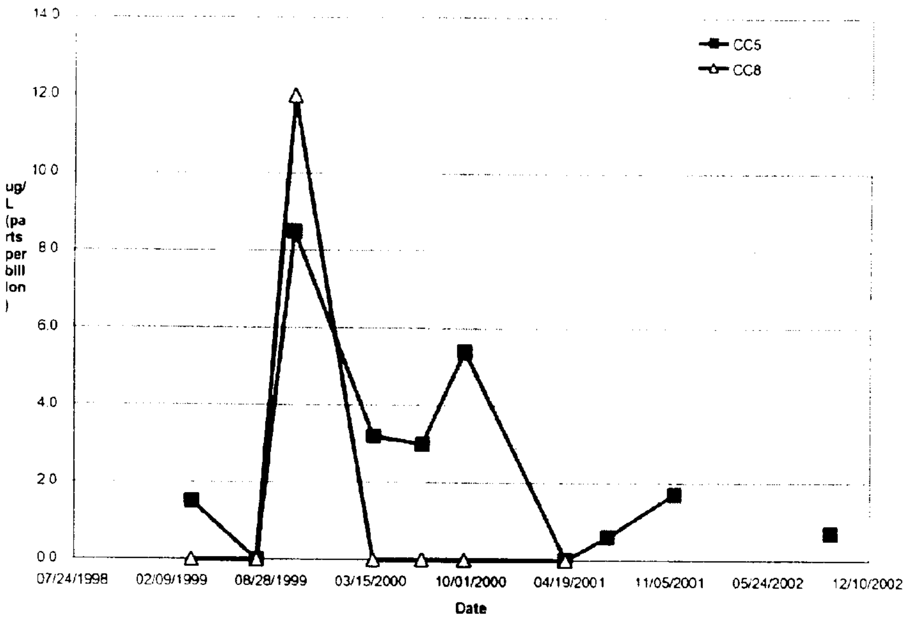


FIGURE 11. WDE Piezometer Ground Water Elevations

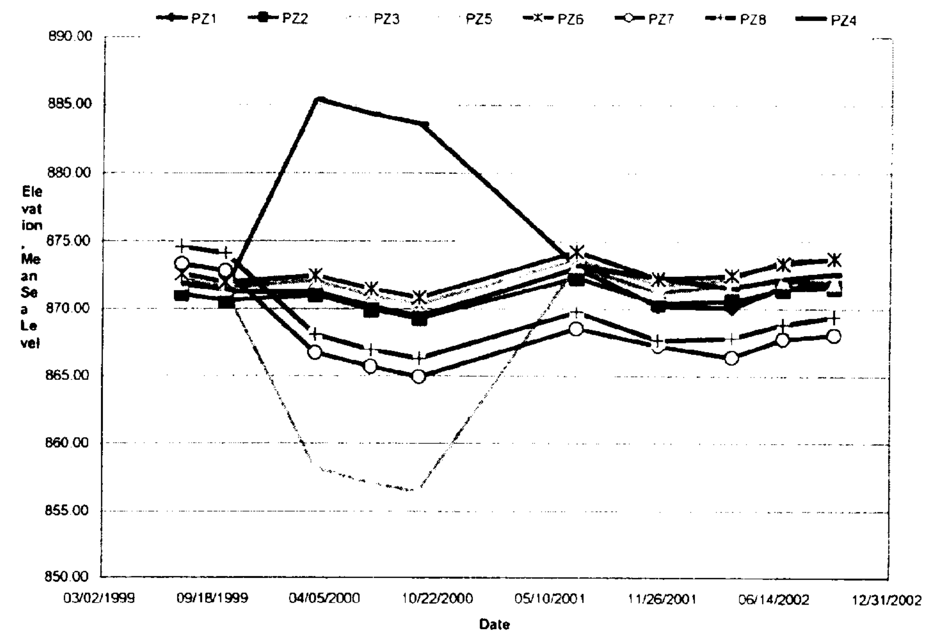


FIGURE 12. WDE Upper Sand Below Fill Water Elevations (A horizon)

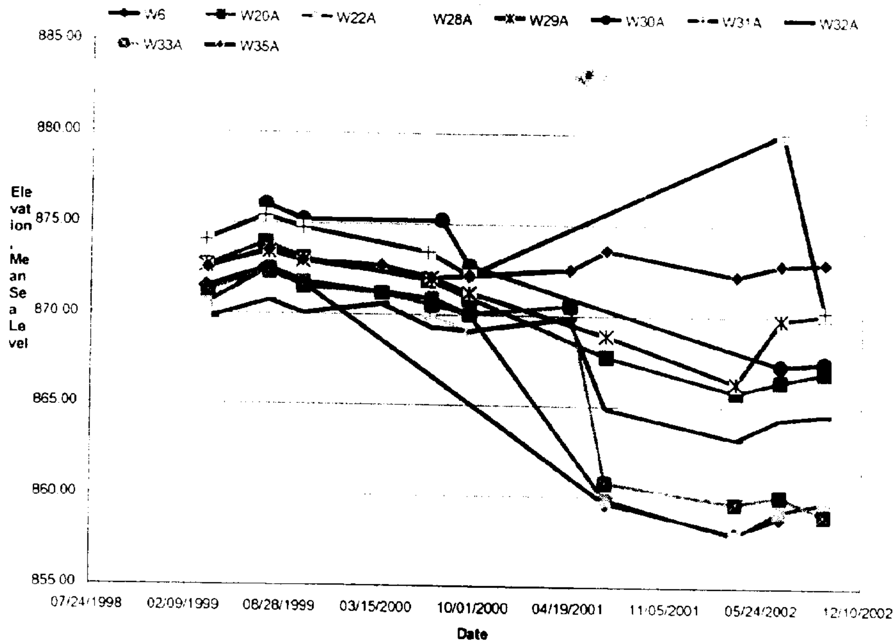
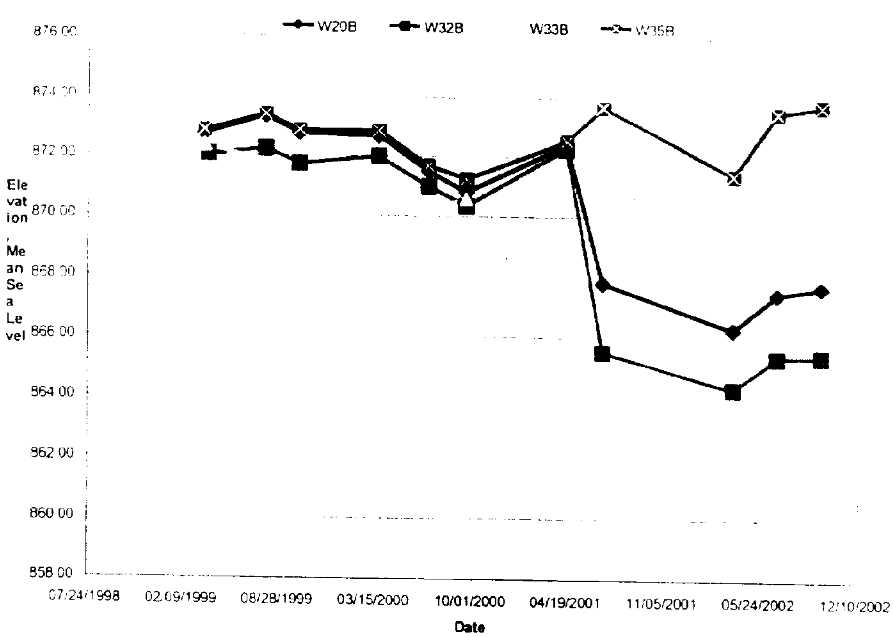


FIGURE 13. WDE Upper Sand Below Fill Water Elevations (B Horizon)



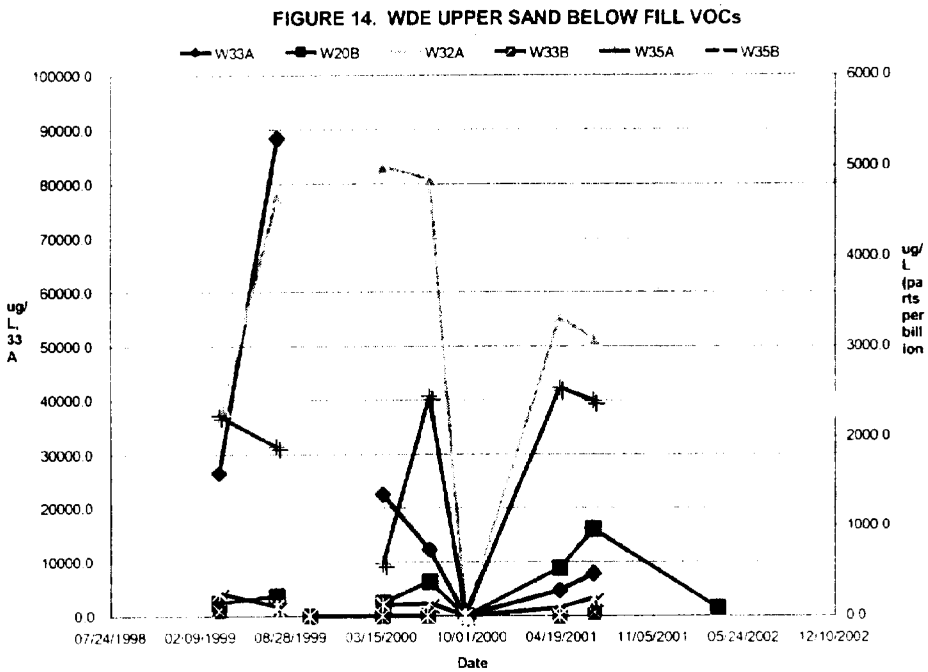


FIGURE 14. WDE UPPER SAND BELOW FILL VOCs
W33A
W20B
W32A
W33B
W35A
W35B
100000.0
90000.0
80000.0
70000.0
60000.0
50000.0
40000.0
30000.0
20000.0
10000.0
0.0
ug/L, 33A
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
ug/L (parts per billion)
07/24/1998
02/09/1999
08/28/1999
03/15/2000
10/01/2000
04/19/2001
11/05/2001
05/24/2002
12/10/2002
Date

FIGURE 15. WDE TOP UPPER SAND WATER ELEVATIONS(1)

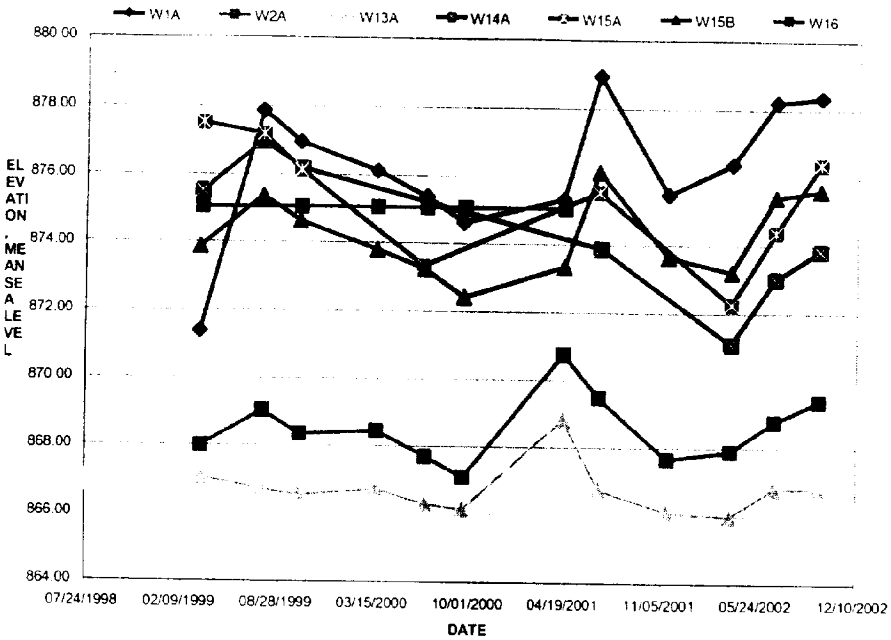


FIGURE 16. WDE TOP UPPER SAND WATER ELEVATIONS(2)

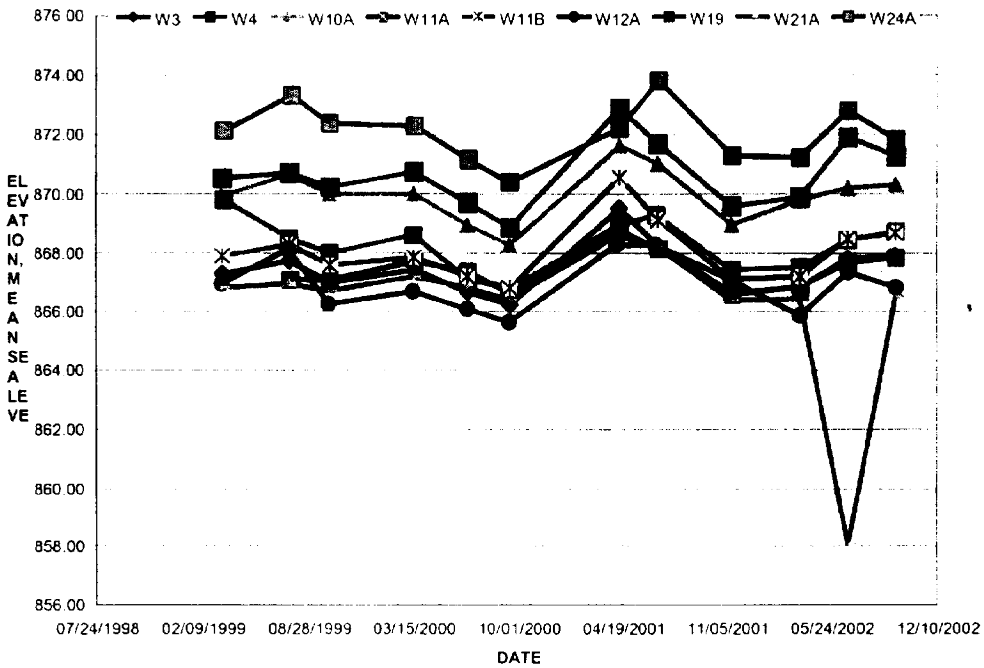


FIGURE 17. WDE TOP UPPER SAND VOCs(1)

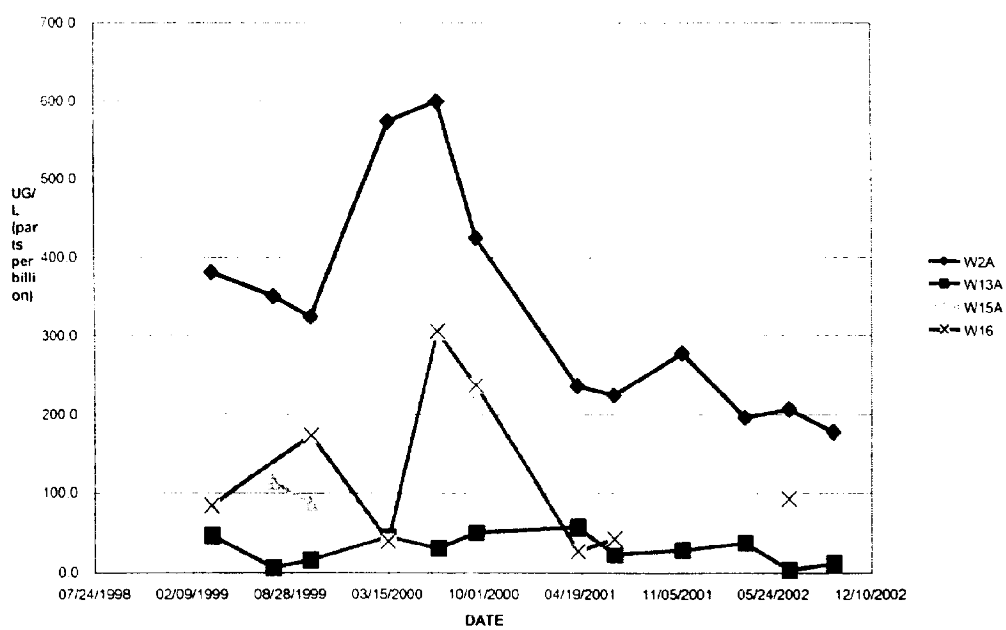


FIGURE 18. WDE TOP UPPER SAND VOCs(2)

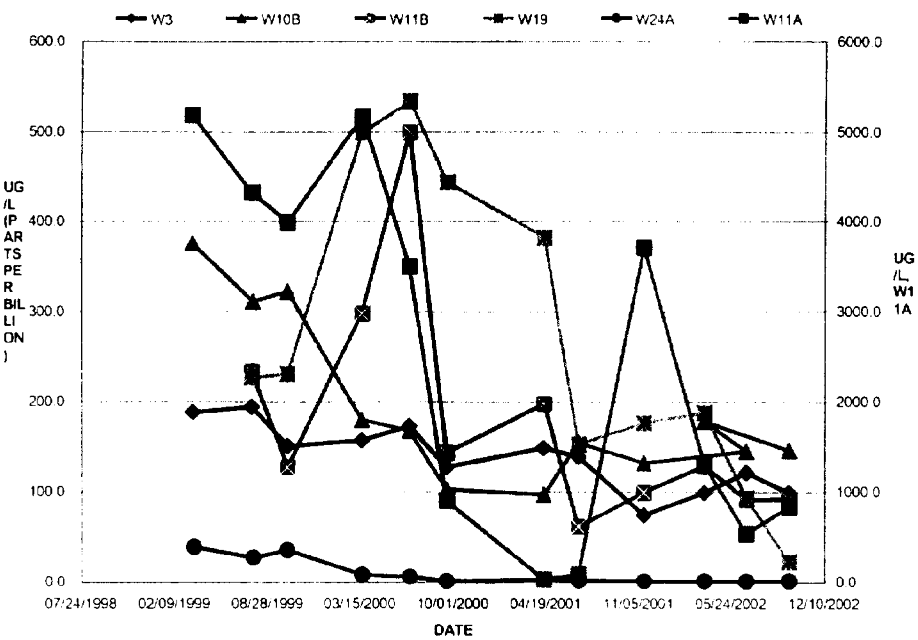


FIGURE 19. WDE BOTTOM UPPER SAND WATER ELEVATIONS

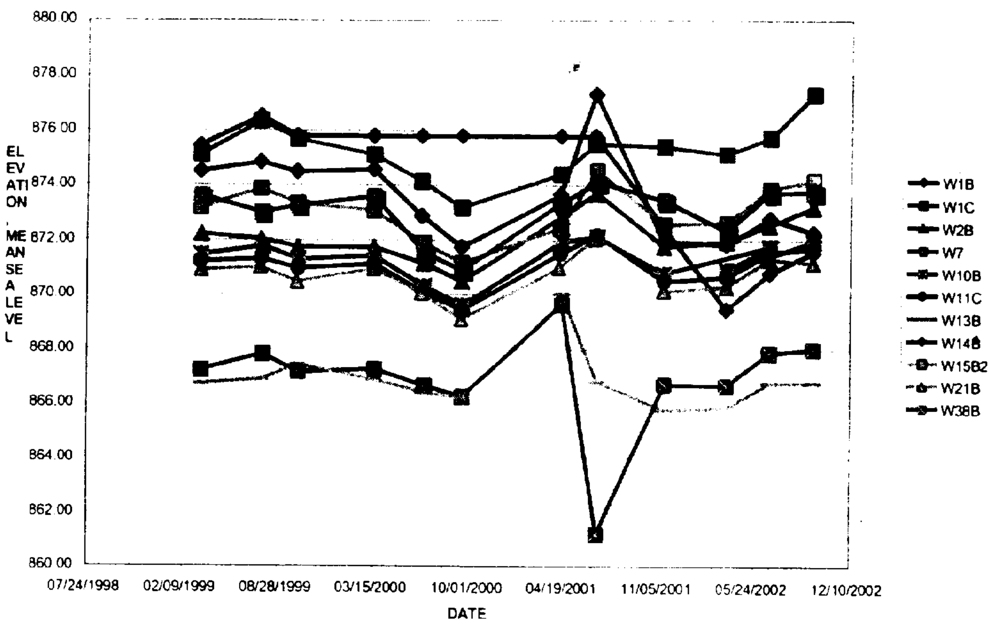


FIGURE 20. WDE BOTTOM UPPER SAND VOCs

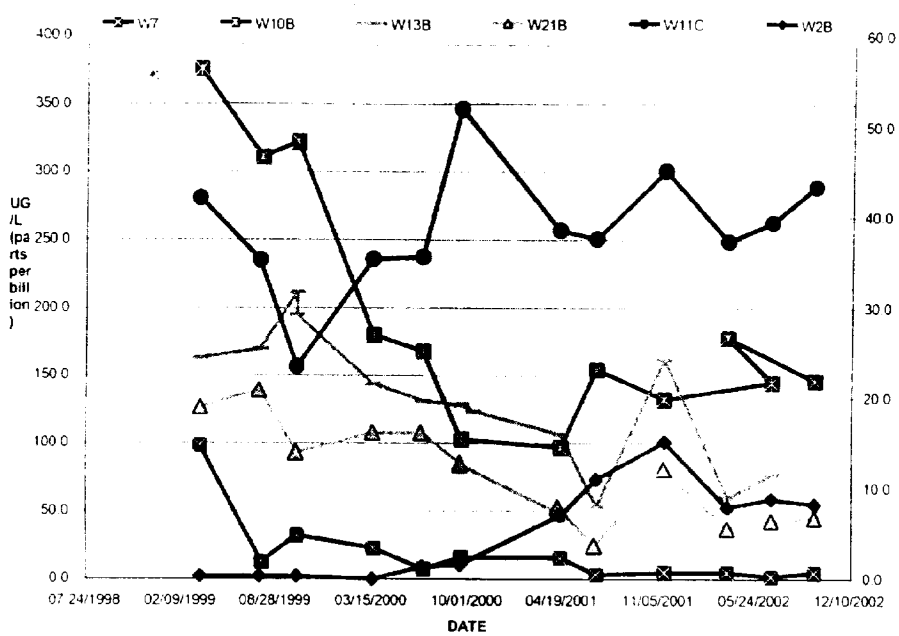


FIGURE 21. WDE WATER ELEVATIONS NORTH OF COON CREEK

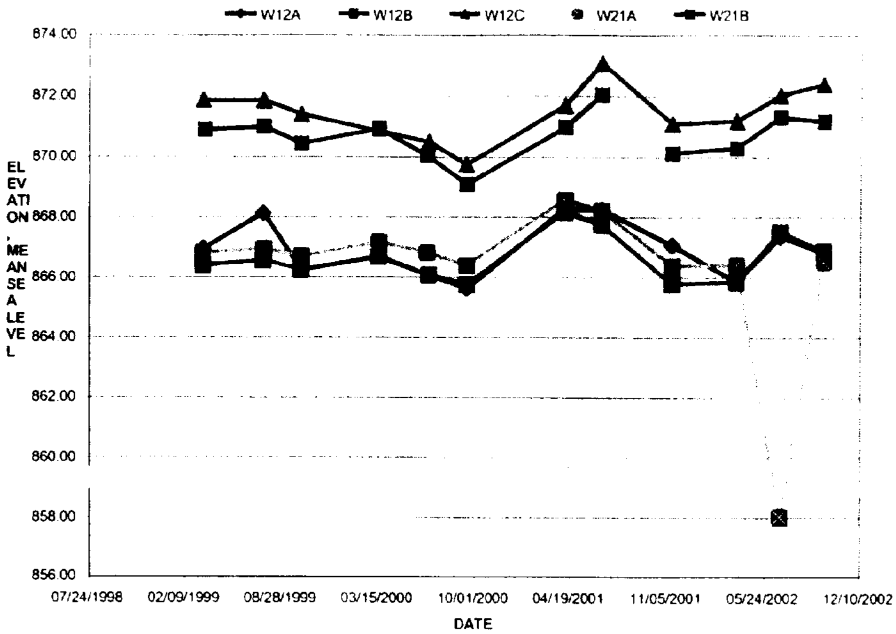


FIGURE 22. WDE VOCs NORTH OF COON CREEK

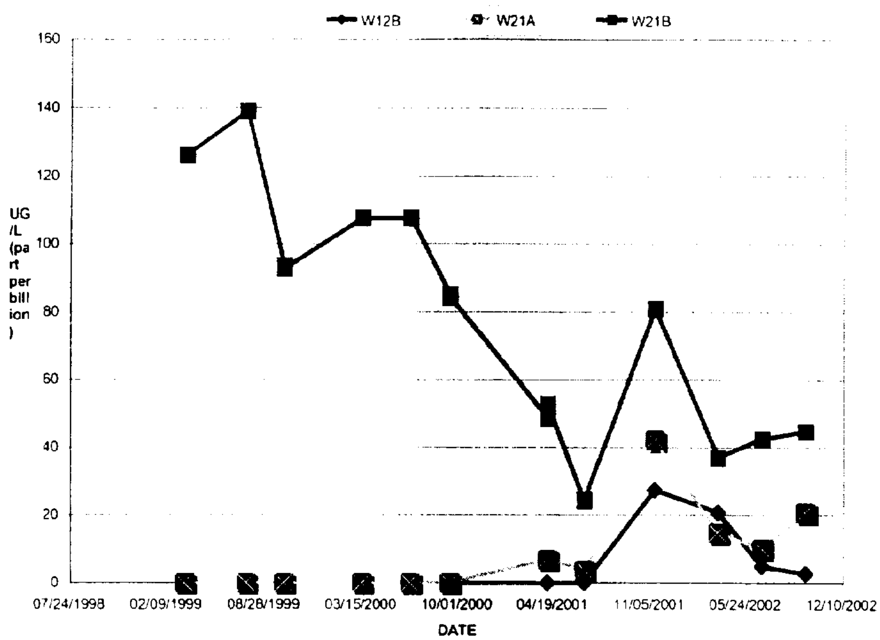


Figure 23. WDE Effluent VOCs

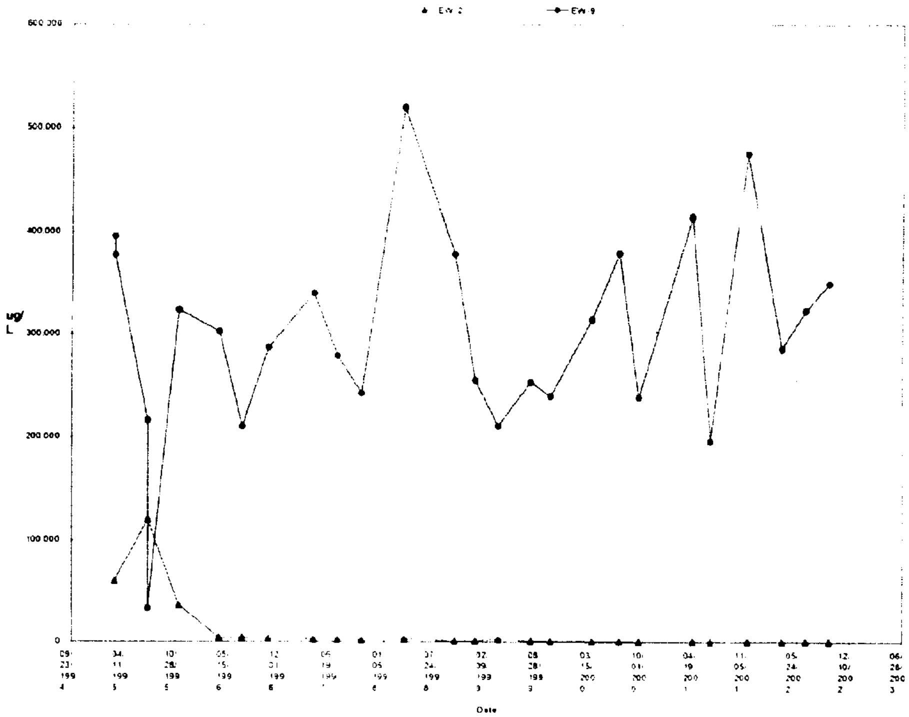
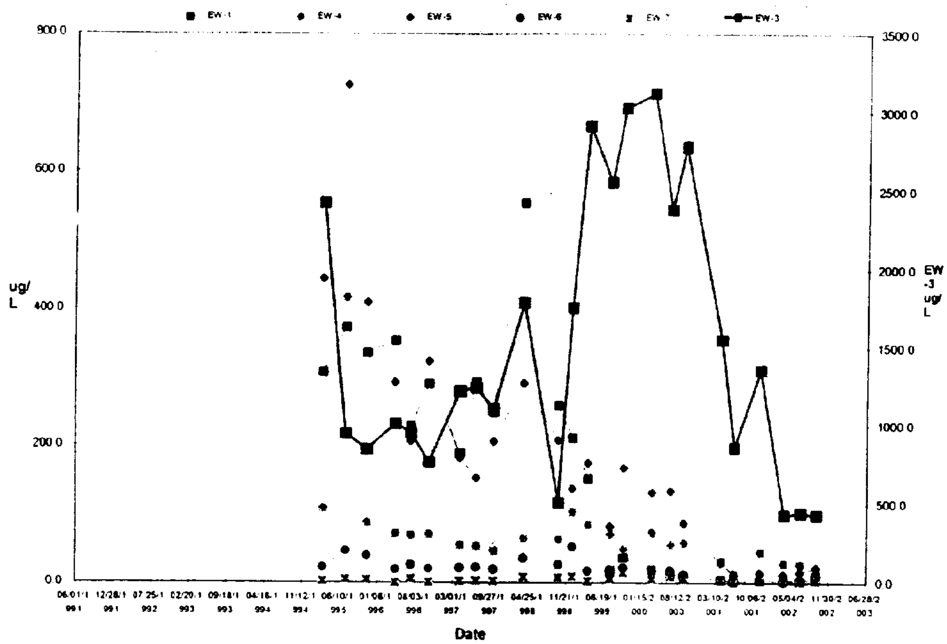


Figure 24. WDE Effluent VOCs low



Contour Map of Total Volatile Organic Compounds
Upper Sand, Water Table

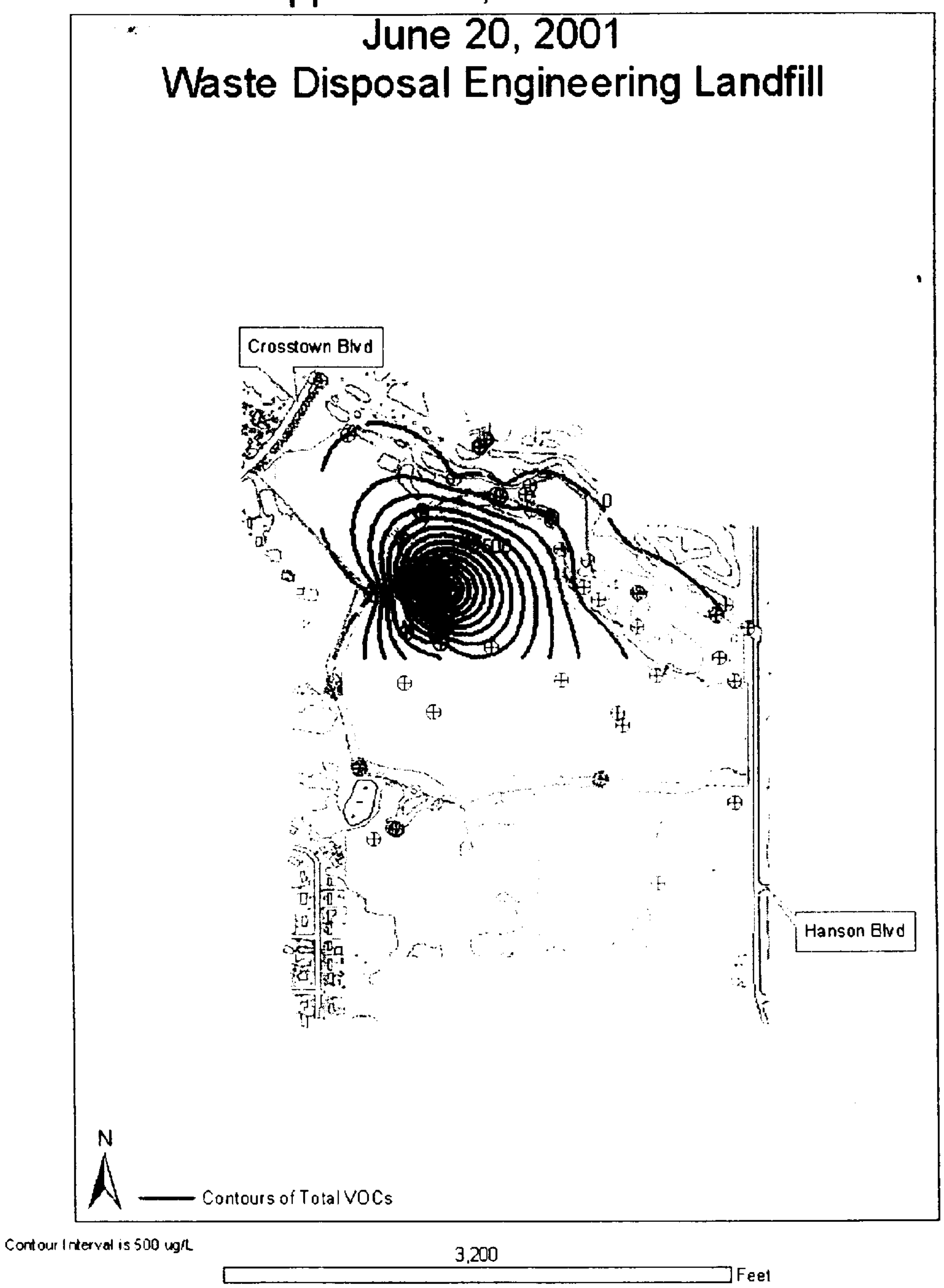


Figure 25 (Highest concentration detected over the two year period)

Total Volatile Organic Compounds, April 2001
Waste Disposal Engineering Landfill

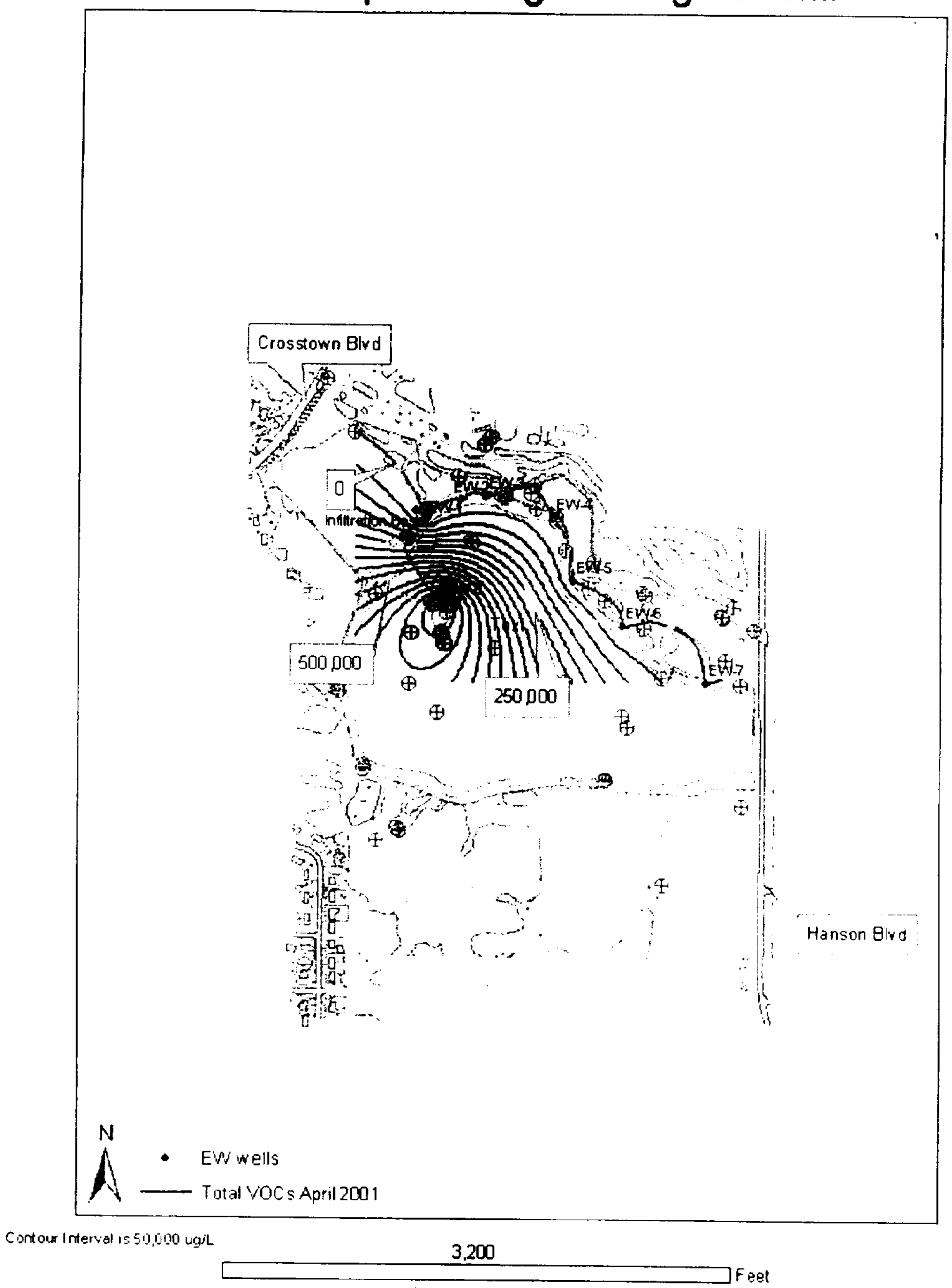


Figure 26

Total Volatile Organic Compounds, March 2002
Waste Disposal Engineering Landfill

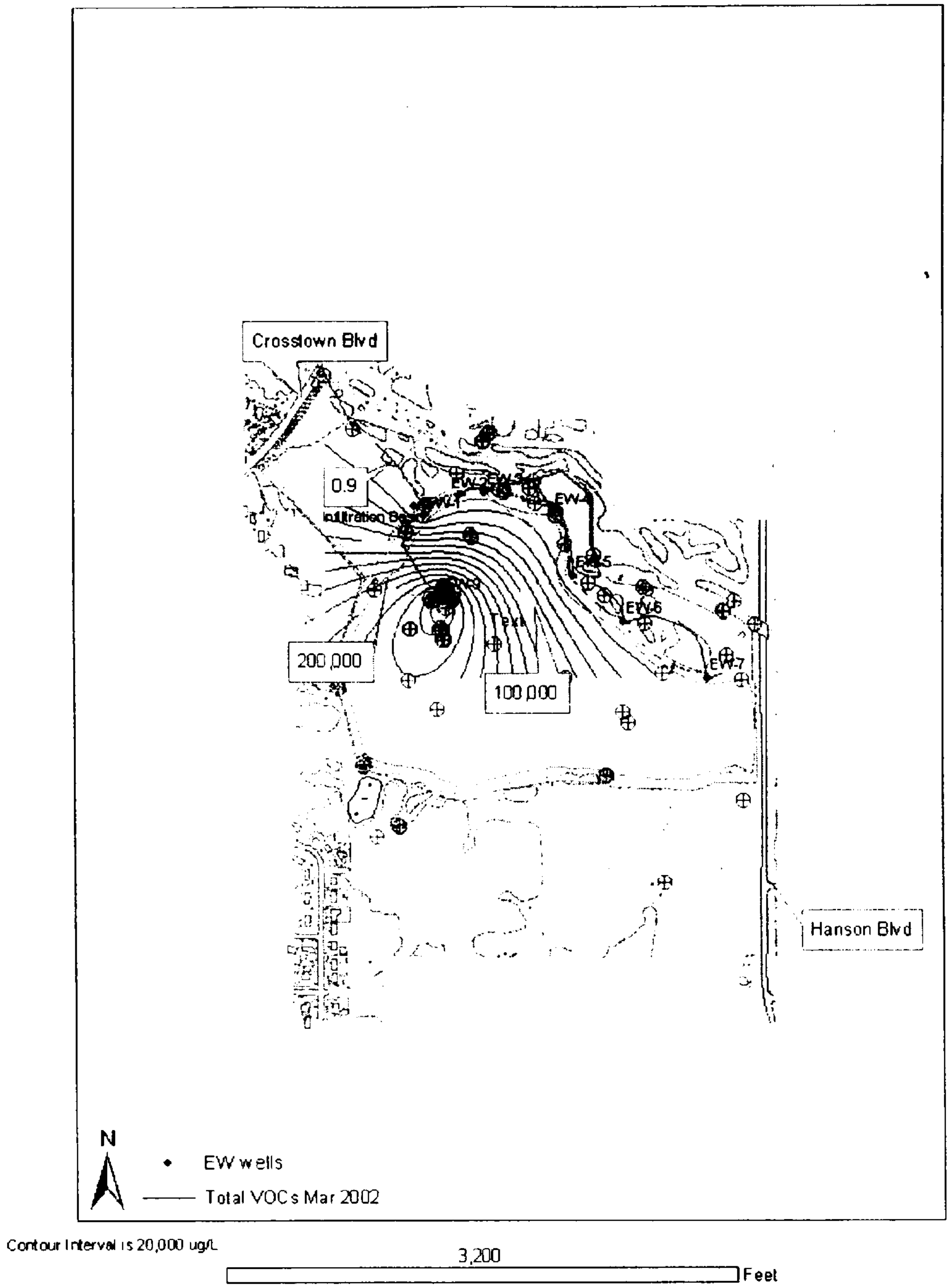


Figure 27

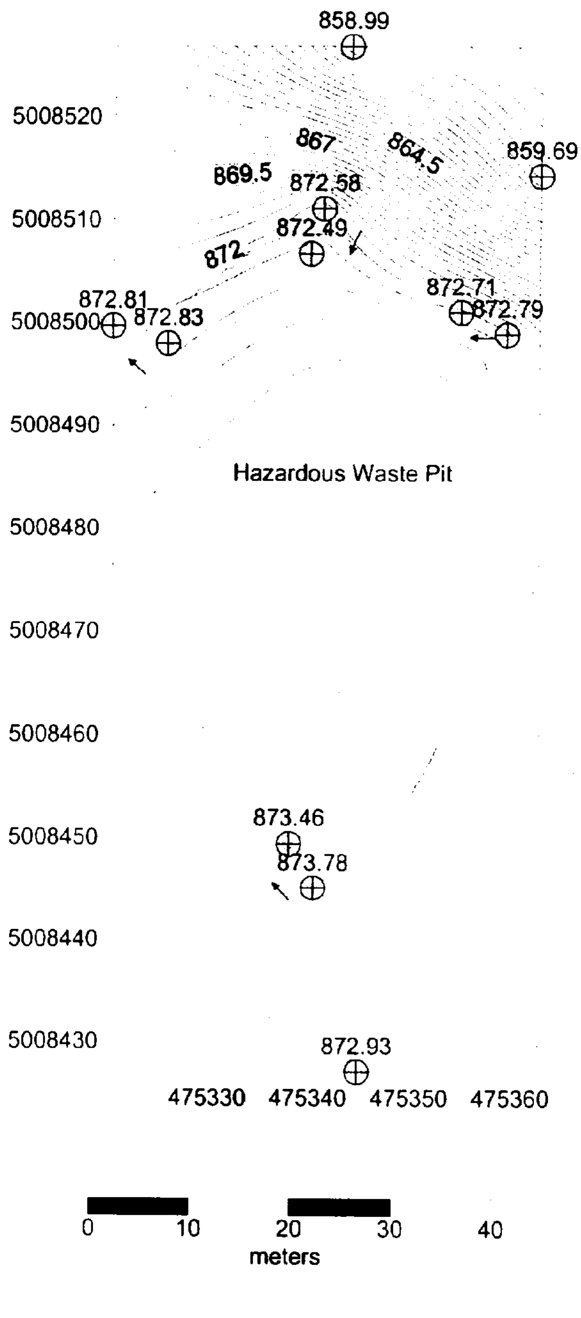


Figure 28 Flow around the hazardous waste pit in September of 2002 (EW-9 in previous figure is in the hazardous waste pit).

Figure 29(a). WDE Treatment System VOCs before Active Gas Extraction

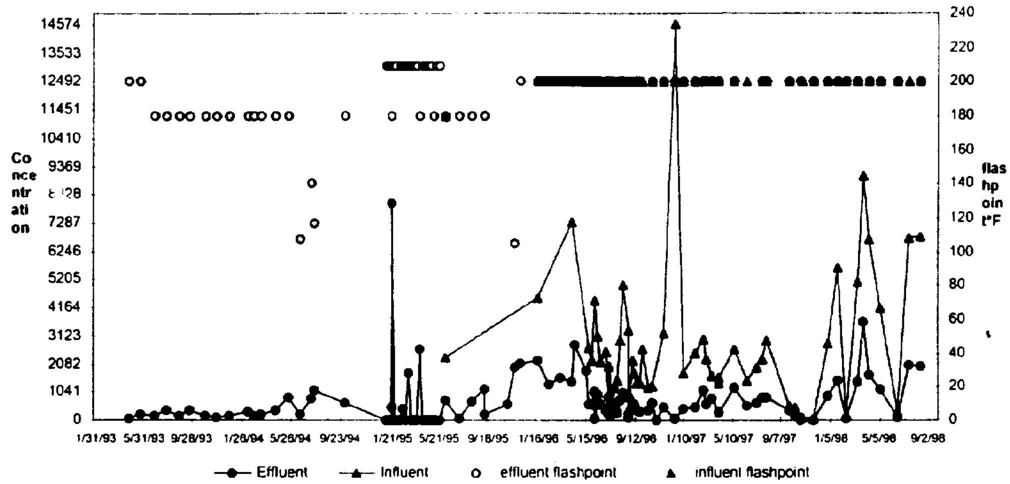


Figure 29(b). WDE Treatment System VOCs after Active Gas Extraction

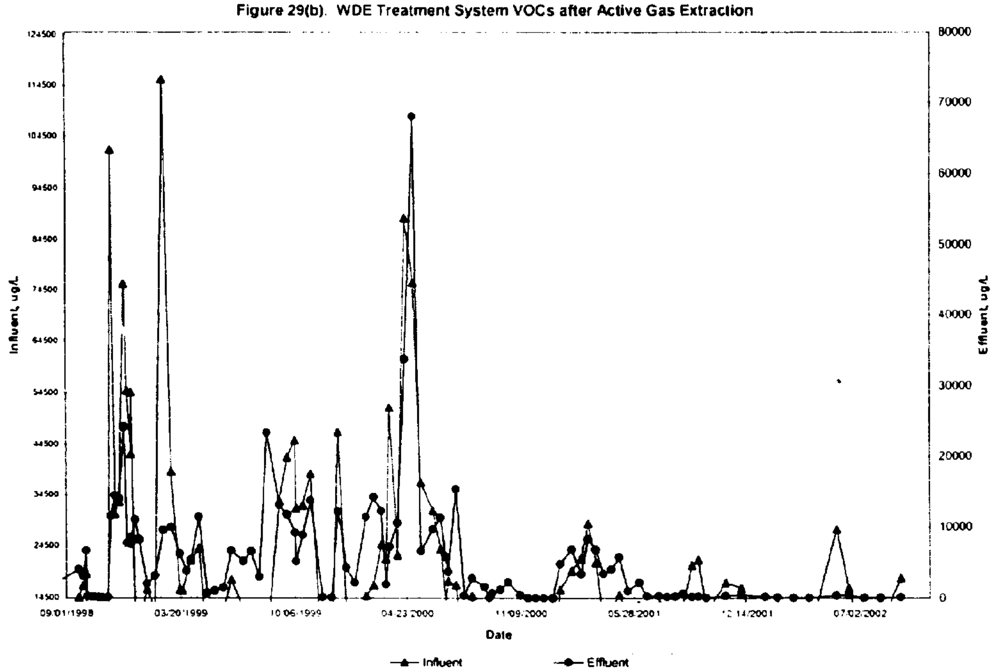
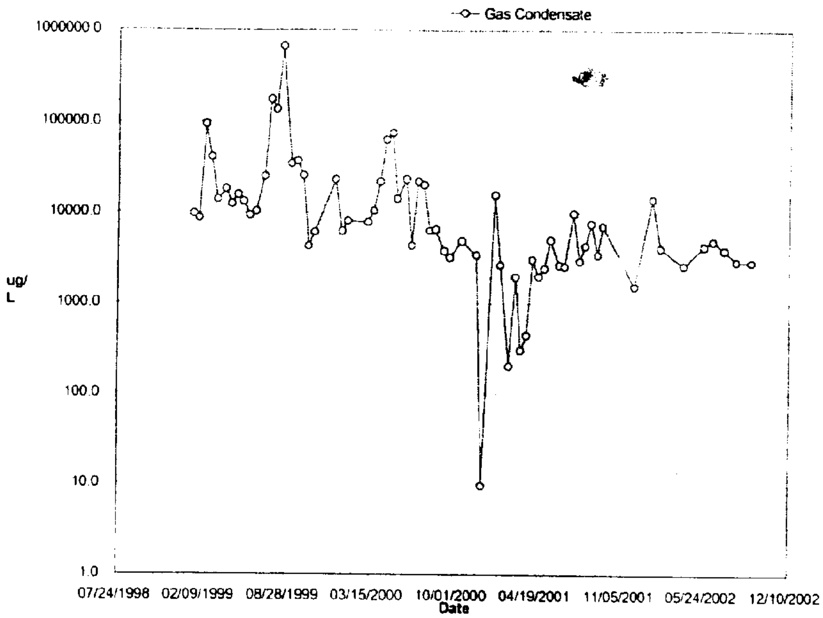


Figure 30. WDE Gas Condensate Total VOC Concentrations



Groundwater Contour Map, Upper Sand, Water Table
Summer 2002

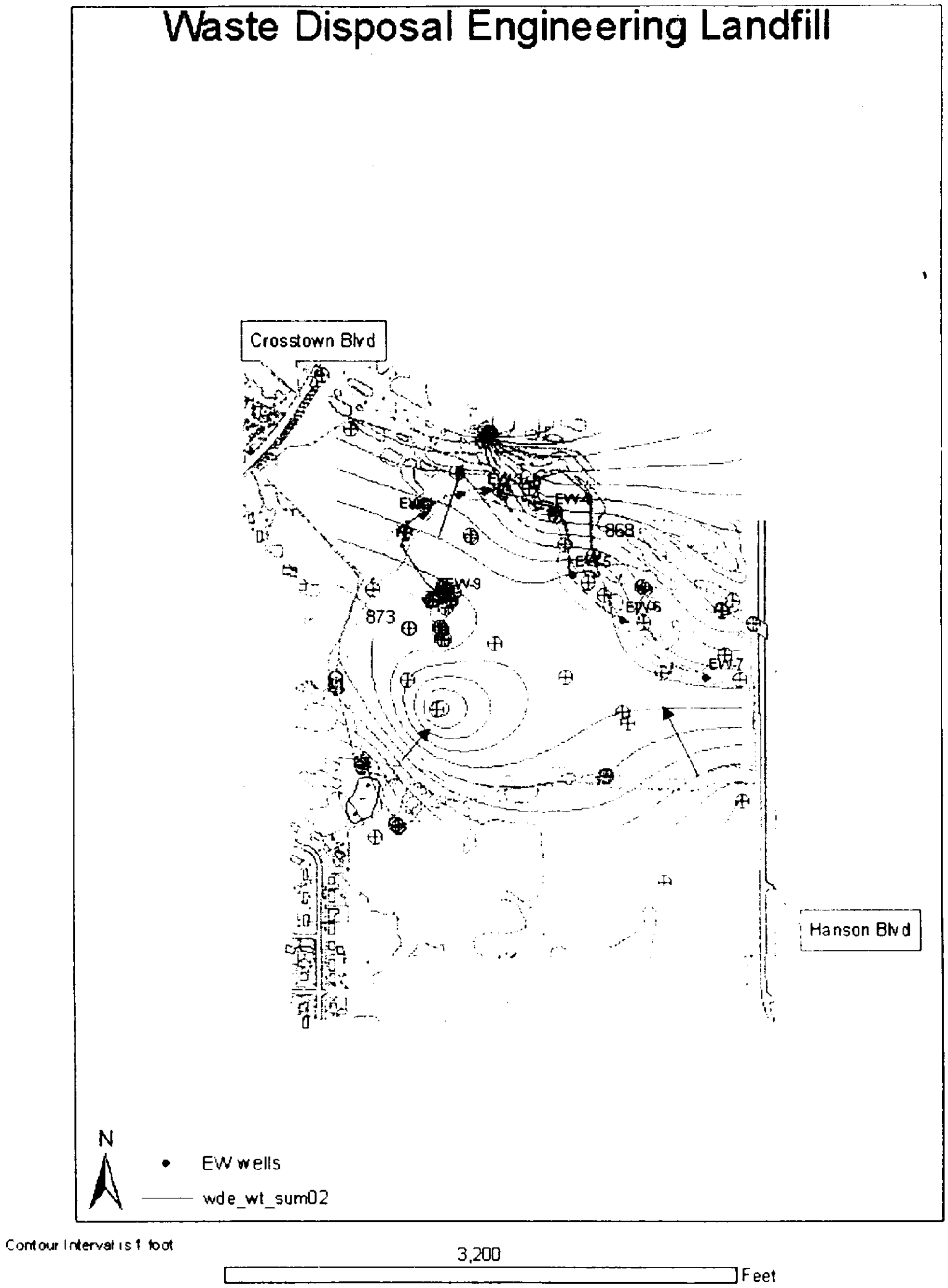


Figure 31

Groundwater Contour Map, base of Upper Sand
March 2002

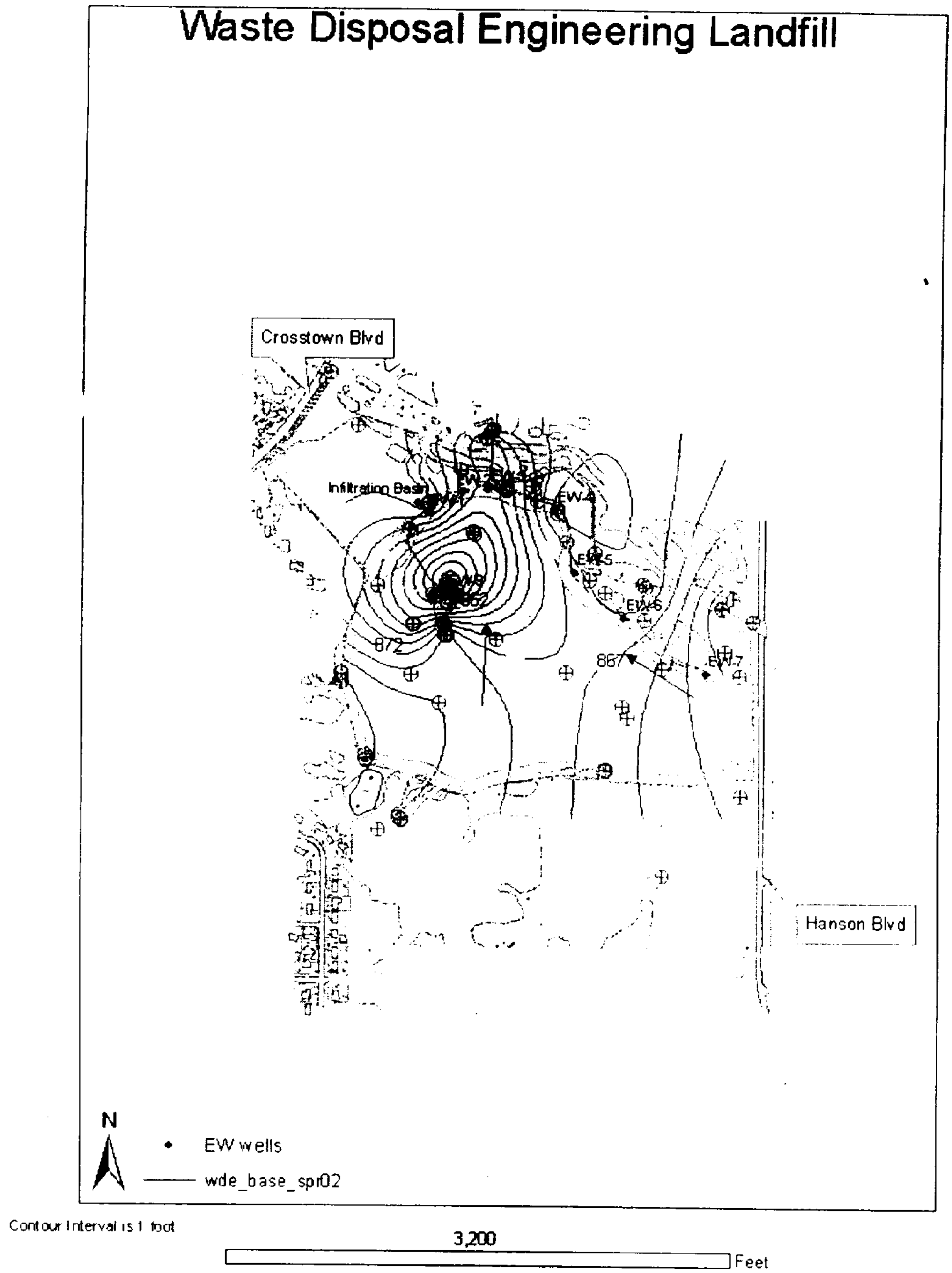


Figure 32

Groundwater Contour Map, Lower Sand
September 2002

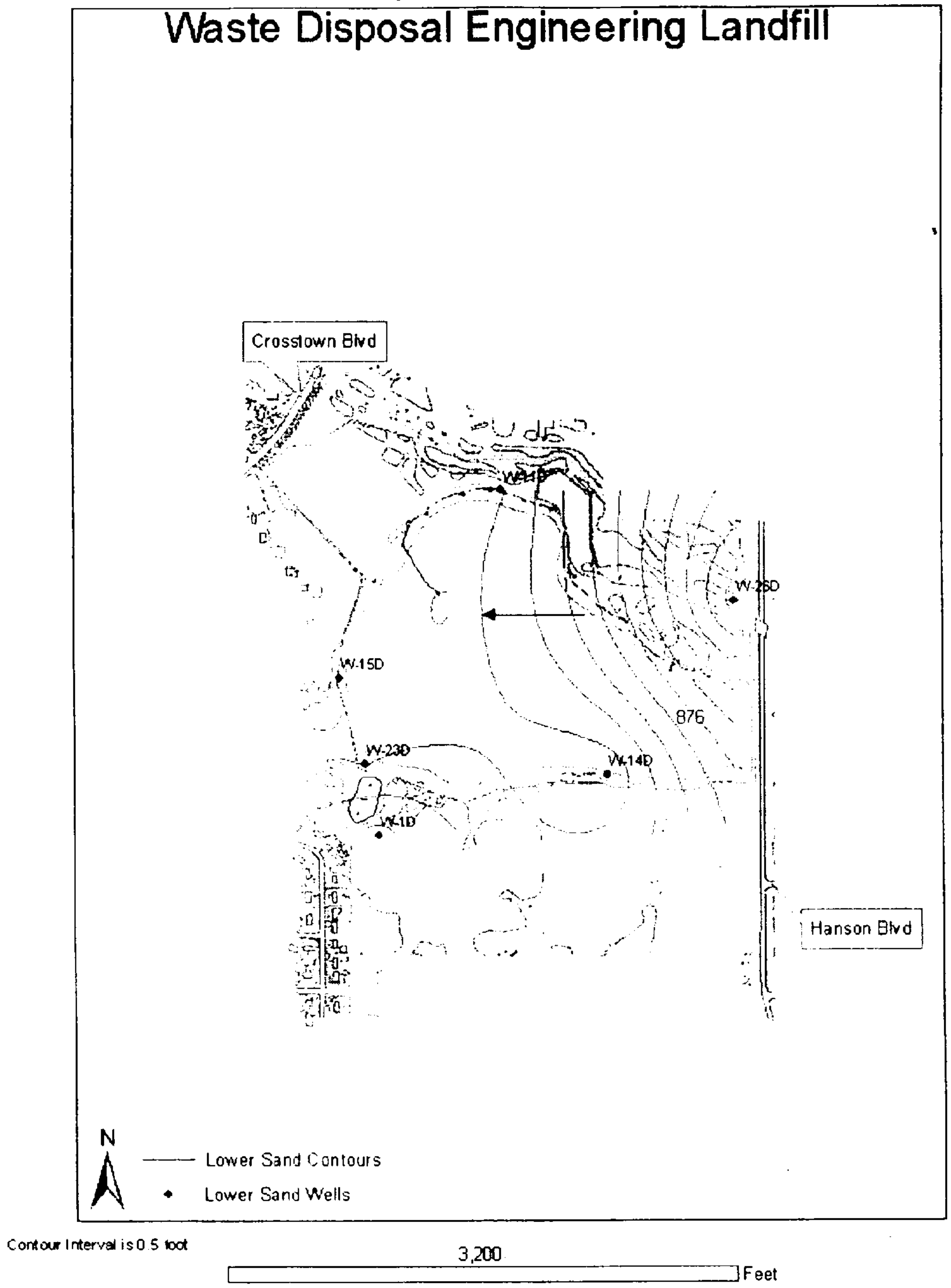


Figure 33

Figure 34. Total Toxic Compounds in WDE influent